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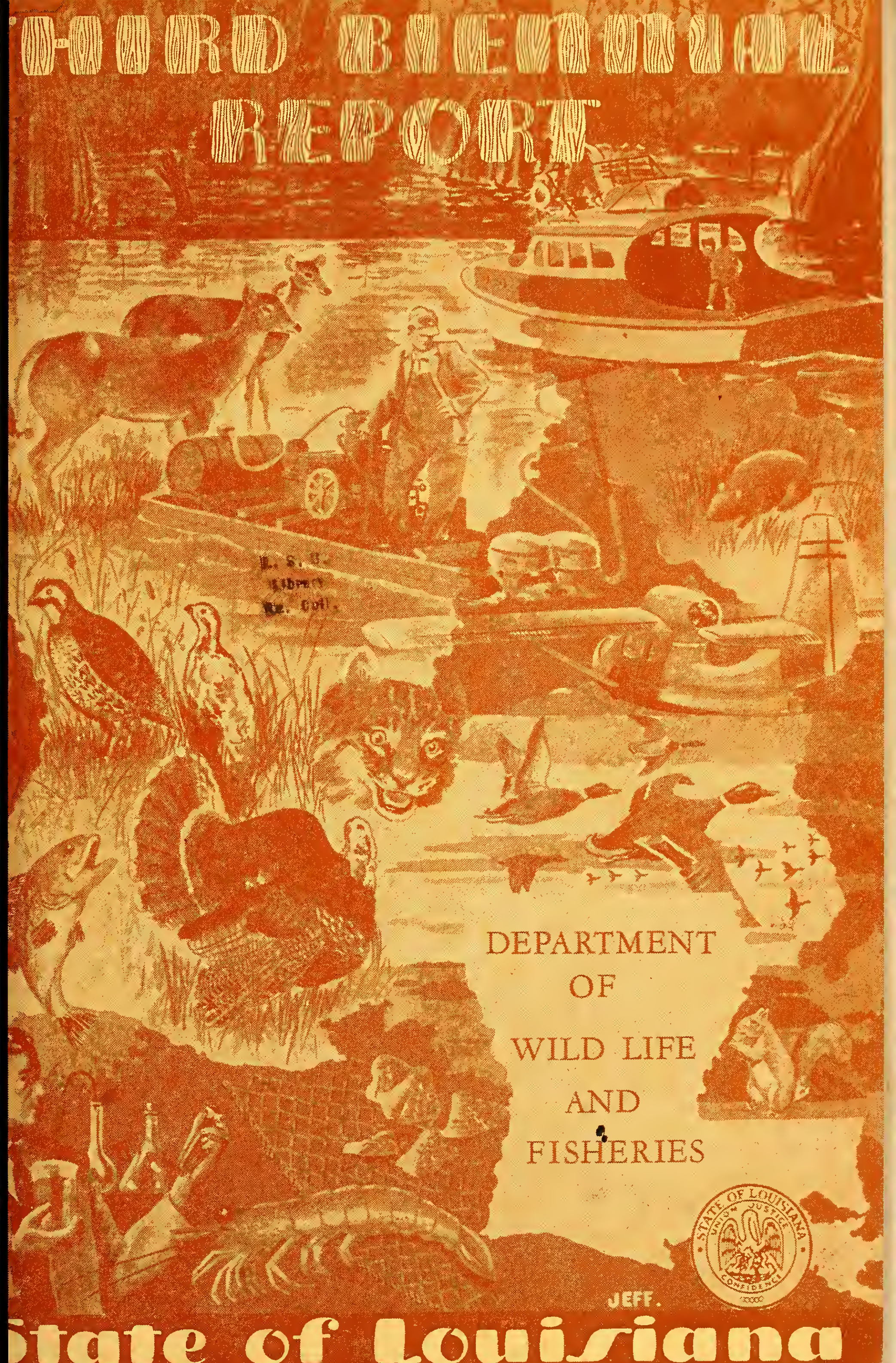
THIRD BIENNIAL REPORT



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DEPARTMENT
OF
WILD LIFE
AND
FISHERIES

State of Louisiana
1948 1949

Third Biennial Report

DEPARTMENT
of
WILD LIFE and FISHERIES

STATE OF LOUISIANA
1948 - 1949

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Published by
DEPARTMENT OF WILD LIFE AND FISHERIES
126 Civil Courts Building
New Orleans, La.
1950

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Edited and compiled by
Mel Washburn, Director,
Division of Education and Publicity.

PERSONNEL

DEPARTMENT OF WILD LIFE AND FISHERIES

STATE OF LOUISIANA

ERNEST S. CLEMENTS
Commissioner

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Attorney

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Director, Division of Education and Publicity

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Director, Division of Enforcement

FRANK COOGAN
Director, Division of Research and Statistics

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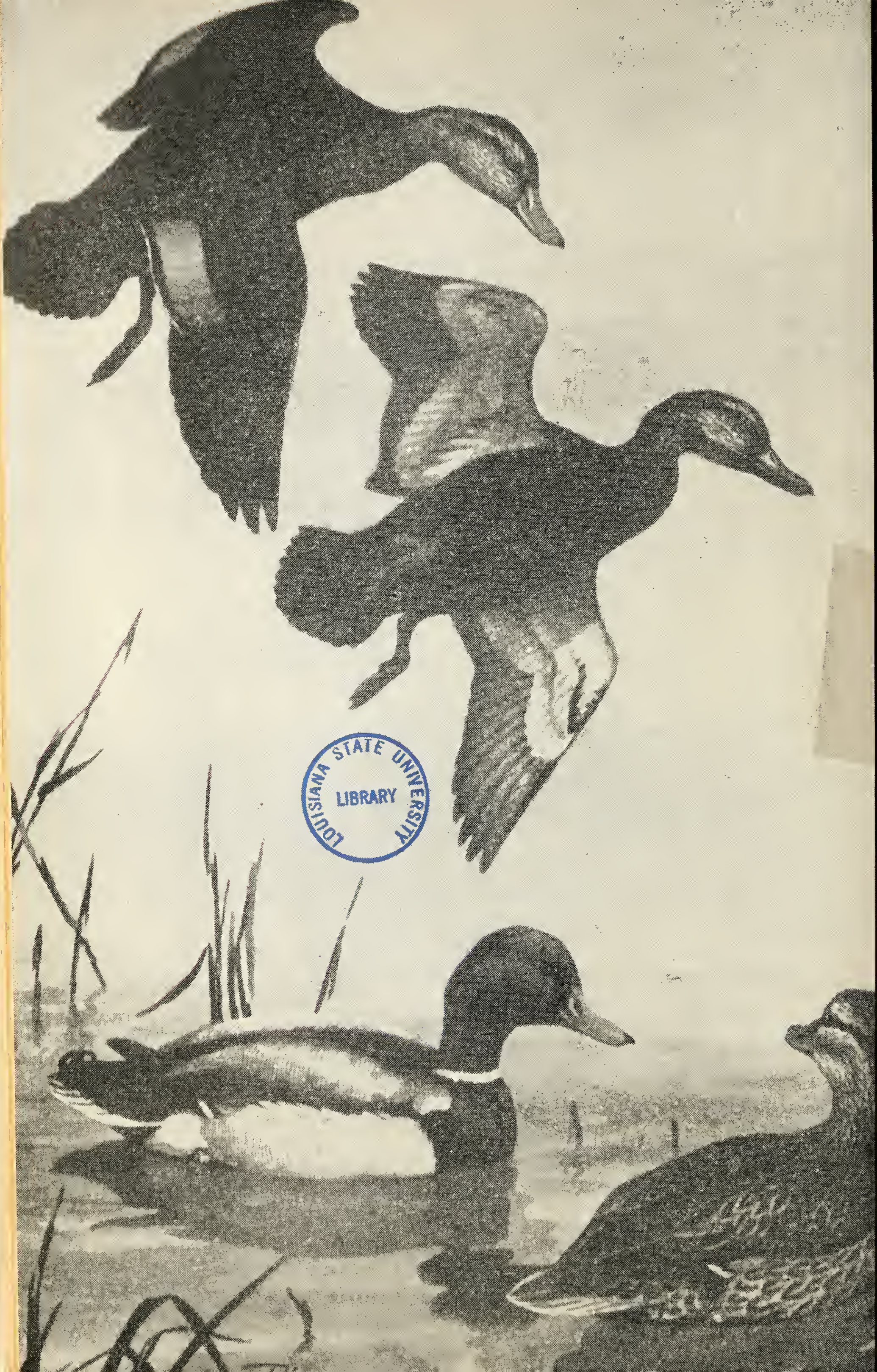
Chief Biologist

HENRY L. WHITE
Chief Accountant



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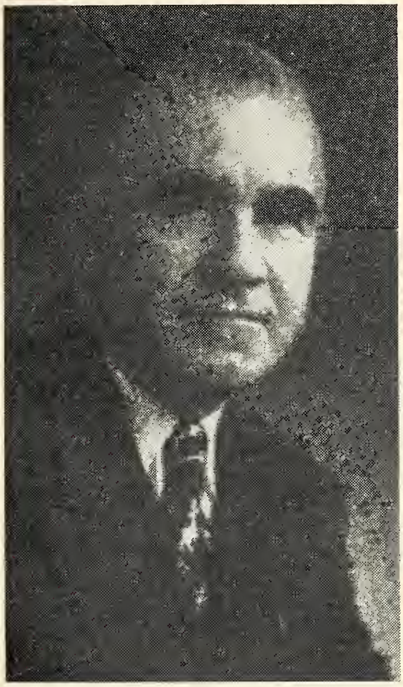
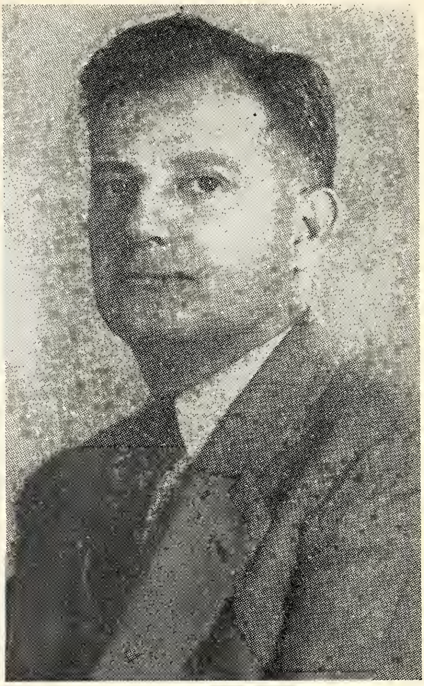


ERNEST S. CLEMENTS
Commissioner of Wild Life
and Fisheries



EARL K. LONG
Governor of the State
of Louisiana

Conservation Pledge

WE GIVE OUR PLEDGE
AS AMERICANS
TO SAVE AND FAITHFULLY TO
DEFEND FROM WASTE
THE NATURAL RESOURCES OF
OUR COUNTRY—ITS SOIL
AND MINERALS, ITS
FORESTS, WATERS,
AND WILDLIFE

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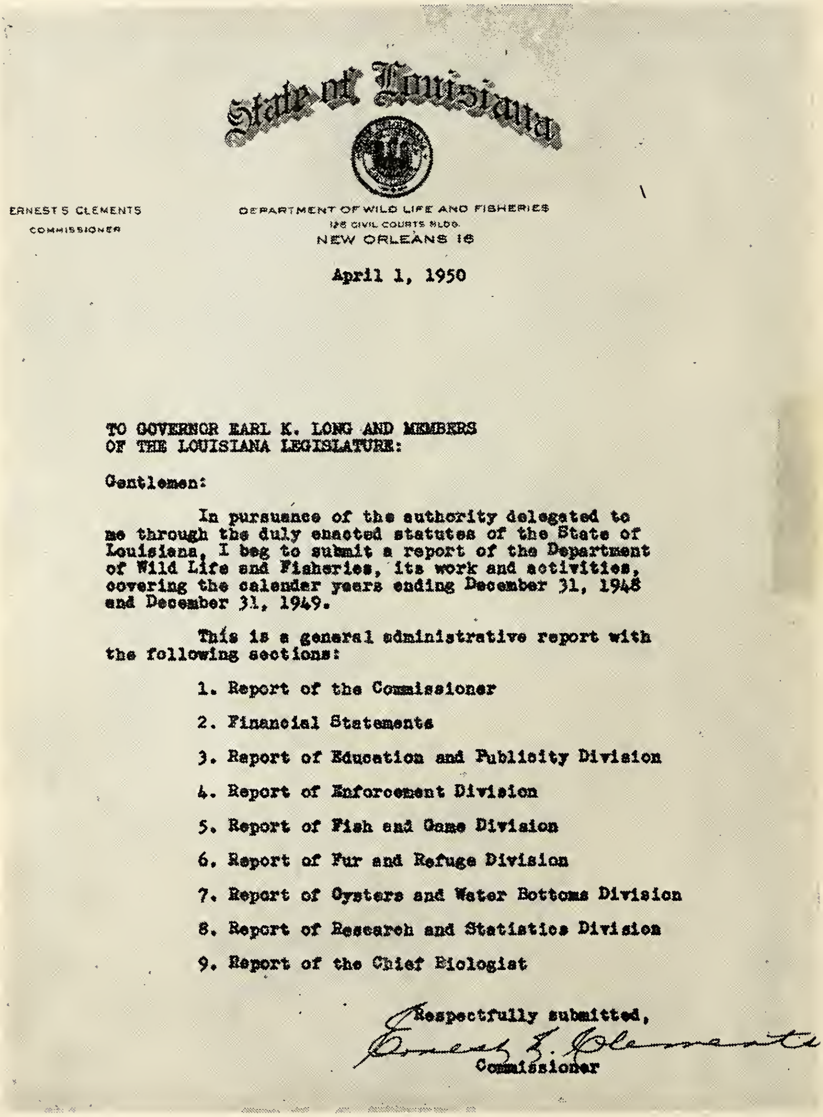
LETTER OF TRANSMITTAL



State of Louisiana

ERNEST S CLEMENTS
COMMISSIONER

DEPARTMENT OF WILD LIFE AND FISHERIES
126 CIVIL COURTS BLDG.
NEW ORLEANS 16

April 1, 1950

TO GOVERNOR EARL K. LONG AND MEMBERS
OF THE LOUISIANA LEGISLATURE:

Gentlemen:

In pursuance of the authority delegated to me through the duly enacted statutes of the State of Louisiana, I beg to submit a report of the Department of Wild Life and Fisheries, its work and activities, covering the calendar years ending December 31, 1948 and December 31, 1949.

This is a general administrative report with the following sections:

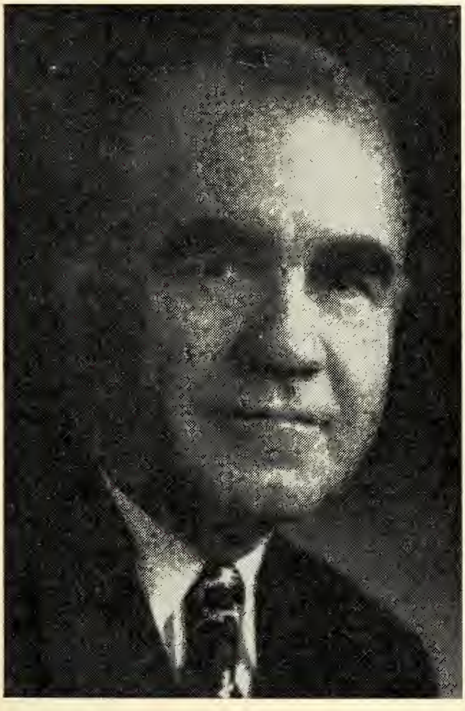
1. Report of the Commissioner
2. Financial Statements
3. Report of Education and Publicity Division
4. Report of Enforcement Division
5. Report of Fish and Game Division
6. Report of Fur and Refuge Division
7. Report of Oysters and Water Bottoms Division
8. Report of Research and Statistics Division
9. Report of the Chief Biologist

Respectfully submitted,

Ernest S. Clements
Commissioner

REPORT OF ERNEST S. CLEMENTS, COMMISSIONER DEPARTMENT OF WILD LIFE AND FISHERIES

New Orleans, La.
April 1, 1950



Ernest S. Clements

THE Department of Wild Life and Fisheries was created on December 11, 1944, when voters of Louisiana approved an Amendment to the State Constitution in the general election of November, 1944, to make three separate and independent state departments out of the former Department of Conservation. This Department was charged with the responsibility of protecting, conserving and propagating the wild life of Louisiana, including wild game and non-game quadrupeds or animals, game, oysters, fish and other aquatic life.

The Department of Wild Life and Fisheries has seven divisions, each administered by a Director, responsible to the Commissioner, and each entrusted with responsibility of carrying on certain activities. The divisions are as follows:

1. Administration
2. Education and Publicity
3. Enforcement

4. Fish and Game
5. Fur and Refuge
6. Oysters and Water Bottoms
7. Research and Statistics

The revenues received and collected by the Department of Wild Life and Fisheries for the operating account, during the two year period covered by this report, have been greater by over $149,172.33 than the appropriation allocated to this Department. The operating account includes all divisions with the exception of the Fur and Refuge Division. This Division has dedicated funds received from sales of furs and royalties and operates out of revenues from these dedicated funds.

Our actual revenues for the fiscal year ending June 30, 1949, amounted to $1,038,472.33, while the actual expenditures for that same period amounted to $887,536.42.

Considerable progress in all phases of wildlife conservation has been made in Louisiana during the period covered by this biennial report. Details of this progress will be found in the reports of the various divisions.

Several Pittman-Robertson scientific projects have been completed and others were inaugurated during the biennium. A water hyacinth elimination program, for which the 1948 Legislature made a special appropriation, has made good progress and a concerted effort has been under way to eliminate this pest. Details of the results will found in the report of the Fish and Game Division.

We have made notable progress in our educational program. In September, 1948, the Division of Education and Publicity inaugurated a new publication called "The Louisiana Conservationist". Since that time this magazine, published monthly, except during mid-summer, has grown to a circulation of more than 30,000 copies each issue. The magazine concerns itself entirely with the conservation and restoration of our fish and game and with the education of young and old alike to the needs for conservation methods and good sportsmanship afield. By disseminating stories written by nationally famous authors, as well as members of the Department of Wild Life and Fisheries, an untold amount of desirable public relations and good will has been generated throughout the State of Louisiana. Besides distribution to the various public officials of the state, this magazine is sent to all members of sportman's clubs, wildlife units, individuals, and various organizations, dedicated to the conservation of our State's fish and game. In addition to becoming extremely popular with all its readers in Louisiana, "The Louisiana Conservationist" has attained high rank among similar periodicals produced by various states of the United States. It has won commendation from nationally famous sportsmen, conservationists, outdoor writers, and editors of nationally distributed outdoor magazines. It has possibly done more toward giving all Louisiana a true picture of the fish and game conditions and problems in the state today than any other one effort. In addition to the publication of "The Louisiana Conservationist", the Division of Education and Publicity has made appreciable contacts with civic groups, clubs and various other organizations throughout the state. Representatives of this division have attended meetings, given lectures, exhibited moving pictures and distributed printed matter pertaining to conservation and restoration work. This division has also prepared and set up exhibits at fairs, festivals and similar gatherings at schools, and conventions and other events, to demonstrate our wildlife, and particularly the various species of fish and game in Louisiana. These exhibits have proved remarkably attractive and are becoming more and more in demand throughout the state.

The wildlife museum, maintained, under the supervision of the Education and Publicity Division in the Presbytere in New Orleans, has steadily increased in popularity with visitors as well as local groups. In this museum may be found virtually every specimen of wildlife native to Louisiana. It is the only state owned and maintained museum of its kind in America, and as a consequence, is a definite asset to the true conservation work of this entire Department. In addition to the museum a movie theatre is maintained where educational moving pictures are shown to further increase the education of our youth as well as our adult population to the needs and benefits of fish and game conservation. In furtherance of this work, the Division of Education and Publicity has approximately 50 movies all pointing out some phase of conservation work, and the particular advantages Louisiana enjoys as a state rich in natural resources. A complete report on the activities of the Division of Education and Publicity is contained in that division's report.

Louisiana wild turkey of the kind now being restocked in this state.

Albert Sidney Cain
Attorney for Department of Wild Life and Fisheries

The State of Louisiana leads the nation in the production of raw furs. This is due greatly to the fact that the production of muskrat fur is greater in Louisiana than in all the remainder of America. The annual fur crop is now greater enhanced by a new fur bearer, the nutria or coypu, which has made amazing progress in this state during the last decade. Because of the rapidly increasing popularity of nutria as a commercial fur bearer, this Department has begun the transplanting of these animals to other localities within the boundaries of the state where suitable habitat will insure their future. It has been conservatively estimated that within another 10 years the nutria fur crop will exceed all others in value in Louisiana, and consequently, considerable work is being done by this Department to aid in the development of this new wealth.

Our game and refuge preserves have been improved during the period covered by this report and seven new game preserves have been established. These are:

The West Bay Preserve in Allen Parish; The Red Dirt Preserve in the Kisatchie Division of the U. S. National Forest; The Catahoula Preserve in the Catahoula Division of the U. S. National Forest; The Evangeline Preserve in the Evangeline Division of the U. S. National Forest; the Caldwell Parish Game Refuge No. 1, the Livingston Parish Game Refuge, and the Union Parish Game Refuge No. 1.

Before these game refuges could be established it was necessary for this Department to use predator control units to trap out as many predators as possible in each of these areas and then to set up game management and game protection features necessary to assure the future of all game stocked in each preserve.

Work is now going ahead for the establishment of more such game refuges in other areas of the state where habitat is suitable for the maintenance of game and game bird colonies.

We have made headway in oyster and shrimp research and in other phases of our wildlife conservation program.

But above and beyond all other matters which this Department feels that it may congratulate itself upon for the period of time in which I have been Commissioner, I wish to call special attention to the fact that the very center and kernel of the work of this Department is that of enforcing the game and fish laws; that is to say, in apprehending and prosecuting those who violate the fish, game, fur, shrimp, oyster and other laws which this Department is called upon to require observance. Obviously, without competent enforcement, there would soon be nothing in the line of natural resources that would justify the continued existence of this Department.

We think it is not unreasonable to hope that with this record, law enforcement will be far more effective hereafter.

During the period covered by this report, it has been necessary to completely rebuild or renovate the state's fish and quail hatcheries. In some instances it was necessary to virtually rebuild entirely, buildings, pens, and other facilities, which had been permitted to deteriorate into a condition of almost hopeless repair. The fish hatcheries at Lacombe, Monroe and Beechwood have been repaired and renovated, and repainted and are now models of efficiency. The quail hatcheries at Lacombe and Louisiana State University have also been thoroughly repaired, rehabilitated, and repainted; in some instances considerable new equipment was added for a more successful propagation of our state raised quail.

Four new thermal trucks have been added to the fish rescue division, making it possible to transport fish for hundreds, and in some instances, thousands of miles without damage to the fish.

In addition, another fish rescue crew has been established, greatly augmenting the success of the fish and game division's fish rescue program.

The $150,000 per annum appropriated by the 1948 Legislature and approved by Governor Earl K. Long, has been used for the restocking of fish and game to an extent heretofore deemed impossible. Further details of these fish and game restocking activities will be found in the report of the director of the fish and game division.

Summing up, I believe it is a recognized fact that Louisiana has made definite progress in wildlife conservation during the past two years. The reports of the various divisions detailing this progress speak for themselves.

Ernest S. Clements,
Commissioner

DEPARTMEN OF WILD LIFE & FISHERIES

Financial Statements for the Fiscal Years 1948-1949 and 1949-1950

1. Operating Account
2. Fur & Refuge Account
3. Oyster Seed Ground Account
4. Marsh Island Improvement Fund
5. Dedicated Funds
   (Act 22 of 1946)
6. Civil Fees for Law Violations
7. Lake Bisteneau Dam
   (Act 350—1948)
8. Little River Dam
   (Act 304—1948)
9. Cedar Lake Dam
   (Act 232—1948)
10. Turkey Creek Dam
    (Act 172—1948)
11. Loutre Preserve Dam
    (Act 185—1948)
12. Gulf States Marine Fisheries Commission
    (Act 329—1948)
13. Restocking Fish and Game
    (Act 70—1948)

OPERATING ACCOUNT Means of Financing:	Actual 1948-1949	Estimated 1949-1950
State Appropriation	$ 889,300.00	$ 889,300.00
Board of Liquidation Appropriation		25,000.00
Emergency Appropriation		36,500.00
Pittman Robertson Federal Projects:		
State Appropriation 25%	63,313.24	68,313.24
Federal Allotment 75%	204,939.72	204,939.72
TOTAL -	$ 1,162,552.96	$ 1,224,052.96

Revenue Collections for the account of the Louisiana State Treasury:	Actual 1948-1949	Estimated 1949-1950
Severance Tax		
Sand	$ 1,964.04	$ 2,000.00
Skins, Hides and Furs	44,238.19	20,000.00
Oyster Privilege	21,068.27	22,000.00
Shrimp	66,979.27	70,000.00
Crabs	2.48	
Licenses		
Resident Angling	90,724.32	93,000.00
Non-Resident Angling, 7 Days	215.00	225.00
Non-Resident Angling	1,360.00	1,500.00
Resident Hunting	219,610.11	235,500.00
Non-Resident Hunting, Annual	825.00	1,525.00
Hunting Club	180.00	260.00
Commercial Fishermen, Bait Sellers	3,810.00	4,000.00
Hoop Nets	8,835.00	9,000.00
Commercial Fishermen, Fresh Water Seine	3,555.00	3,600.00
Commercial Fresh Water Tram Nets	4,085.00	4,200.00
Commercial Fresh Water Gill Nets	7,195.00	7,200.00
Commercial Salt Water Fish Seine	1,055.00	1,100.00
Commercial Salt Water Tram Nets	1,800.00	1,800.00
Wholesale Fish Dealers	21,700.00	22,000.00
Wholesale Fish Dealers Agent	1,380.00	1,400.00
Retail Dealer Fish and Sea Food	11,780.00	12,000.00
Oyster Vessel Tonnage	1,773.50	1,800.00
Commercial Salt Water Fish Vessel	460.00	500.00
Commercial Salt Water Shrimp Vessel	12,425.00	12,500.00
Oyster Dredging	11,400.00	11,500.00
Salt Water Shrimp Trawl	32,360.00	32,500.00
Salt Water Shrimp Seines	20.00	30.00
Freight or Ice Boats Carrying Shrimp	2,840.00	3,000.00
Non-Resident Commercial Fishermen	8,400.00	1,000.00
Breeders for Privtae Bird and Animal Preserves	200.00	20.00
Trappers	16,681.64	15,800.00
Resident Fur Buyers	6,150.00	5,100.00
Resident Fur Dealers	6,000.00	4,800.00
Non-Resident Fur Buyers	300.00	
Non-Resident Fur Dealers	300.00	300.00
Bedding Ground	30,991.00	31,000.00
Oyster Shop, Resale Canning—Steam Box	1,350.00	1,400.00
Releasing Lien Fees	43.00	50.00
Miscellaneous		
Department Reports and Other Publications	60.03	75.00
Sale of Assets	336.00	
Royalties from Minerals Leases—Dedicated to Conservation	394,020.48	400,000.00
GRAND TOTALS	$ 1,038,472.33	$ 1,033,685.00

Analysis of Expenditure by Units:

DIVISION OF ADMINISTRATION

Class of Expenditures:		
Salaries	$ 63,097.58	$ 64,500.00
Contractual Services	24,684.62	27,300.00
Traveling Expenses	7,250.18	8,500.00
Materials and Supplies	8,916.80	10,000.00
Special Current Charges	2,597.68	3,000.00
Equipment—Capitol Outlay	6,841.41	1,000.00
Grand Total of Expenditures	$ 113,388.27	$ 114,300.00

DIVISION OF EDUCATION AND PUBLICITY:

Class of Expenditures:

	Actual 1948-1949	Estimated 1949-1950
Salaries	$ 17,084.16	$ 17,100.00
Contractual Services	22,975.27	33,696.50
Traveling Expenses	1,090.33	1,150.00
Materials and Supplies	1,559.64	1,978.00
Special Current Charges	939.30	1,026.00
Equipment—Capitol Outlay	49.50	49.50
Grand Total of Expenditures	$ 43,698.20	$ 55,000.00

DIVISION OF RESEARCH AND STATISTICS

Class of Expenditures:

Salaries	$ 17,175.02	$ 20,900.00
Contractual Services	1,238.00	2,000.00
Traveling Expenses	5,826.35	6,000.00
Materials and Supplies	2,228.36	2,770.00
Special Current Charges	806.80	1.200.00
Equipment—Capitol Outlay	2,971.94	1,000.00
Grand Total of Expenditures	$ 30,246.47	$ 33,870.00

DIVISION OF ENFORCEMENT

Class of Expenditures:

Salaries	$ 283,366.76	$ 296,080.00
Contractual Services	14,771.36	13,096.00
Traveling Expenses	109,940.62	116,300.00
Materials and Supplies	20,969.65	18,530.00
Special Current Charges	12,905.66	13,944.00
Equipment—Capitol Outlay	7,372.39	1,500.00
Major Repairs		400.00
Construction	57.45	36,500.00
Grand Total of Expenditures	$ 449,383.89	$ 496,350.00

DIVISION OF OYSTER AND WATER BOTTOMS

Class of Expenditures:

Salaries	$ 50,853.03	$ 51,219.00
Contractual Services	16,362.71	16,588.53
Traveling Expenses	8,453.16	8,700.00
Materials and Supplies	19,806.47	17,018.00
Special Current Charges	9,693.36	9,900.00
Equipment—Capitol Outlay	2,037.70	554.47
Grand Total of Expenditures	$ 107,206.43	$ 103,980.00

DIVISION OF PITMAN-ROBERTSON

Class of Expenditures:

Salaries	37,556.27	114,444.00
Contractual Services	4,533.10	23,671.00
Traveling Expenses	5,213.98	14,044.00
Materials and Supplies	11,779.83	30,648.96
Special Current Charges	1,695.03	3,500.00
Equipment—Capitol Outlay	6,523.47	71,245.00
Major Repairs		7,700.00
Land and Construction	18,623.00	8,000.00
Grand Total of Expenditures	$ 85,924.68	$ 273,252.96
Grand Total of Expenditures Operating Account	$ 973,461.10	$ 1,224,052.96

DIVISION OF FISH AND GAME

Class of Expenditures:

	Actual 1948-1949	Estimated 1949-1950
Salaries	$ 64,576.45	$ 73,805.00
Contractual Services	12,289.68	12,290.00
Traveling Expenses	13,650.28	16,400.00
Materials and Supplies	29,037.73	30,000.00
Special Current Charges	2,978.04	4,938.00
Equipment—Capitol Outlay	10,595.42	6,267.00
Major Repairs	10,485.56	3,600.00
Grand Total of Expenditures	$ 143,613.16	$ 147,300.00

FUR AND REFUGE ACCOUNT

Means of Financing:

Dedicated Revenues to the propagation and protection of preserves:

	Actual 1948-1949	Estimated 1949-1950
Sale of Furs	$ 65,331.59	$ 18,000.00
Sale of Alligator Skins	706.35	500.00
Rental of Unimproved Lands—Pasture	2,112.00	2,000.00
Miscellaneous	6.50	
Insurance Recoveries	3,106.31	2,209.27
Mineral Leases	....	20,000.00
	$ 71,262.75	$ 42,709.27

Cash Balance Fiscal Year Ending June 30, 1948	$ 123,601.41
Revenue Fiscal Year ending June 30, 1949	71,262.75
	$ 194,864.16
Expenditures Fiscal Year ending June 30, 1949	111,393.97
	$ 83,470.19
Estimated Revenue Fiscal Year ending June 30, 1950	42,709.27
	$ 126,179.46
Estimated Expenditures Fiscal Year ending June 30, 1950	118,987.11
Unencumbered Balance June 30, 1950, estimated	$ 7,192.35

Analysis of Expenditures:

Class of Expenditures:

	Actual 1948-1949	Estimated 1949-1950
Salaries	$ 64,418.72	$ 65,000.00
Contractual Services	9,334.15	6,500.00
Traveling Expenses	12,522.97	13,000.00
Materials and Supplies	20,436.05	13,000.00
Special Current Charges	2,894.90	2,700.00
Equipment—Capitol Outlay	1,383.63	10,000.00
Major Repairs	23.25	3,500.00
Land and Construction	101.83	400.00
Insurance Recoveries—Damage Claim	278.47	4,887.11
Grand Total of Expenditures	$ 111,393.97	$ 118,987.11

OYSTER SEED GROUND ACCOUNT

Means of Financing:	Actual 1948-1949	Estimated 1949-1950
Dedicated Revenue to the establishment of Oyster Seed Grounds and to the planting, propagation, cultivating, policing, preservation and distribution of oysters as set forth in Act No. 227		
Tax on Shells taken from State owned Water Bottoms	$ 105,318.73	
Insurance Recoveries	5,331.86	
	$ 110,650.59	
Cash Balance Fiscal Year ending June 30, 1948	$ 86,273.32	
Revenue Fiscal Year ending June 30, 1949	110,650.59	
	$ 196,923.91	
Expenditures Fiscal Year ending June 30, 1949	100,817.45	
	$ 96,106.46	
Estimated Revenue Fiscal Year ending June 30, 1950	106,000.00	
	$ 202,106.46	
Estimated Expenditures Fiscal Year ending June 30, 1950	95,200.00	
Unencumbered Balance June 30, 1950, estimated	$ 106,906.46	
Analysis of Expenditures:		
Class of Expenditures:		
Salaries	$ 17,774.29	$ 25,000.00
Constractual Services	32,518.74	12,000.00
Traveling Expenses	3,786.93	8,000.00
Materials and Supplies	10,006.14	16,000.00
Special Current Charges	632.19	1,200.00
Equipment—Capitol Outlay	28,645.55	12,000.00
Major Repairs	879.14	3,000.00
Land and Construction	1,242.61	18,000.00
Insurance Recoveries—Damage Claim	5,331.86	
Grand Total of Expenditures	$ 100,817.45	$ 95,200.00

FUR AND REFUGE—MASH ISLAND IMPROVEMENT FUND

Means of Financing:	
Funds received from the Russell Sage-Marsh Island Lease for improvements to the Marsh Island Refuge:	
Cash Balance Fiscal Year ending June 30, 1948	$ 59,329.58
Expenditures Fiscal Year ending June 30, 1949	11,939.44
Unencumbered Balance June 30, 1949	$ 47,390.14
Estimated Expenditures Fiscal Year ending June 30, 1950	14,010.00
Unencumbered Balance June 30, 1950, Estimated	$ 33,380.14

Analysis of Expenditures:	Actual 1948-1949	Estimated 1949-1950
Class of Expenditures:		
Salaries	$ 735.16	$ 1,000.00
Contractual Services	719.56	500.00
Traveling Expenses	10.28	10.00
Materials and Supplies	7,164.13	7,000.00
Equipment—Capitol Outlay	1,555.65	3,500.00
Major Repairs	1,754.66	2,000.00
Grand Total of Expenditures	$ 11,939.44	$ 14,010.00

DEDICATED FUNDS ACT 22 OF 1946

Means of Financing:	
Proceeds One-Half Resident Hunting License allotted as follows:	
50% for purchase, construction and Maintenance of Public Shooting Grounds	
Cash Balance Fiscal year ending June 30, 1948	$ 162,177.08
25% for Predator Control	
Cash Balance Fiscal Year ending June 30, 1948	70,264.26
Total Cash Baalnce Fiscal Year ending June 30, 1948	$ 232,441.34
Expenditures Fiscal Year ending June 30, 1949	19,498.40
Unencumbered Balance June 30, 1949	$ 212,942.94
Estimated Expenditures Fiscal year ending June 30, 1950	42,300.00
Unencumbered Balance June 30, 1949	$ 170,642.94

Analysis of Expenditures:		
Class of expenditures:		
Salaries	$ 10,486.67	$ 20,000.00
Contractual Services	931.44	1,200.00
Traveling Expenses	4,651.13	12,000.00
Materials and Supplies	1,354.50	3,000.00
Special Current Charges	233.85	900.00
Equipment—Capitol Outlay	1,840.81	4,000.00
Major Repairs	....	1,200.00
Grand Total of Expenditures	$ 19,498.40	$ 42,300.00

RESTOCKING FISH AND GAME
Act 70 of 1948

Means of Financing:	
For the purpose of purchasing Quail, Deer, Turkey and other Wild Game and Restocking Lakes and Streams with Fish:	
Appropriation 1948-1949	$ 150,000.00
Expenditures Fiscal Year ending June 30, 1949	100,871.16
Cash Balance forwarded to Fiscal Year 1949-1950	49,128.84
Appropriation 1949-1950	150,000.00
	$ 199,128.84
Estimated Expenditures Fiscal Year ending June 30, 1950	197,900.00
Unencumbered Balance Fiscal Year end- June 30, 1950, Estimated	$ 1,228.84

Analysis of Expenditures: Class of Expenditures:	Actual 1948-1949	Estimated 1949-1950
Salaries	$ 15,574.81	$ 30,000.00
Contractual Services	3,865.56	8,000.00
Traveling Expenses	4,546.31	8,500.00
Materials and Supplies	11,492.27	13,000.00
Special Current Charges	352.37	400.00
Equipment—Capitol Outlay (Automotive, Farm, Quail, Deer, Turkey, Etc.)	62,789.38	138,000.00
Land and Construction	2,250.46	
Grand Total of Expenditures	$ 100,871.16	$ 197,900.00
Lake Bisteneau Dam—Special Appropriation Act 350 of 1948—$210,000.00 Expenditures	None	$ 210,000.00
Little River Dam—Special Appropriation Act 304 of 1948—$25,000.00 Expenditures	None	25,000.00
Cedar Lake Dam—Special Appropriation Act 232 of 1948—$100,000.00 Expenditures	None	100,000.00
Turkey Creek Dam—Special Appropriation Act 172 of 1948—$100,000.00 Expenditures	None	100,000.00
Loutre Preserve Dam—Special Appropriation Act 185 of 1948—$100,000.00 Expenditures	None	100,000.00
Gulf States Marine Fisheries Compact—Special Appropriation—Act 329 of 1948—$10,000.00 Expenditures	None	10,000.00

CIVIL FEES FOR LAW VIOLATIONS

Fees Collected and Transmitted to the Following Parish School Boards During Fiscal Year 1948-1949

Ascension	$ 525.00	Plaquemines	37.50
Assumption	37.50	Pointe Coupee	875.50
Avoyelles	87.50	Rapides	75.00
Bienville	325.00	Richland	437.50
Caddo	12.50	St. Bernard	50.00
Calcasieu	245.00	St. Charles	187.50
Caldwell	225.00	St. Helena	49.71
Cameron	75.00	St. James	75.00
Catahoula	45.00	St. John The Baptist	325.00
Claiborne	150.00	St. Landry	500.00
Concordia	512.50	St. Martin	12.50
DeSoto	12.50	St. Mary	62.50
East Feliciana	162.50	St. Tammany	637.50
Evangeline	110.00	Sabine	37.50
Franklin	25.00	Tangipahoa	149.48
Grant	12.50	Terrebonne	400.00
Iberia	50.00	Union	10.00
Iberville	359.75	Vermilion	85.00
Jackson	37.50	Vernon	75.00
Jefferson	400.00	Washington	400.00
Lafourche	25.00	Webster	249.00
LaSalle	187.50	West Feliciana	162.50
Morehouse	627.50	Winn	25.00
Natchitoches	262.50		
Ouachita	186.47	Total	$9,617.41

One of the "habitat" exhibits in the State Wild Life Museum in New Orleans showing woodcock in their natural surroundings.

DIVISION OF EDUCATION AND PUBLICITY

MEL WASHBURN, *Director*

Mel Washburn

TO this division is delegated many and varied activities, principally however, is this division supposed to concern itself with the promotion of conservation of Louisiana's natural resources insofar as wildlife and fisheries are concerned.

It is our responsibility to educate the people of Louisiana to the importance of Louisiana's fish and game. We have endeavored to do this through many sources, no one method of promoting the true spirit of conservation could possibly be entirely successful, thus it is necessary to use every known method for the dissemination and distribution of all types of information on education and publicity.

In order to do this we must have a working knowledge of the activities and ambitions of every division within this Department. The Division of Education and Publicity is, above all, the clearing house for all types of information sought by the peoples of this State and by out of state individuals, organizations, bureaus and institutions. By answering the many queries that come to the attention of this division every day, we are able to acquaint both Louisianians and out of state information seekers of the wildlife natural resources that Louisiana possesses at the same time we are able to impress on these the necessity for true conservation.

It is becoming more and more evident to everyone in Louisiana that a more favorable public sentiment is being created throughout the state with respect to our own wildlife and fisheries resources. This general absorption of education concerning conservation can generally be attributed to the public relations contacts that this office develops.

Wild Life Museum

The Louisiana Department of Wild Life and Fisheries is one of the few state departments in America maintaining a museum of natural resources. This museum, located in the Presbytere in New Orleans, across from the famous Jackson Square, is in a state owned building and consequently its operating cost may be held to a minimum.

There are approximately three thousand individual exhibits of wildlife and fish arranged for attractive display in the various rooms of the museum, and they are constantly being added to by a technical staff which consists of one technician and taxidermist, and one artist, who develops and arranges the backgrounds to simulate the natural habitat of the specimens on display. Other personnel required to operate this museum consists of one custodial workman, one receptionist and one supervisor of visual education.

In this museum is a movie theatre with a seating capacity of more than 200, where moving pictures are shown of various wildlife and conservation subjects. The schools and other groups daily, throughout the year, visit this institution. It is estimated that an average of approximately 10,000 persons visit our museum each month.

At the present time there is a library of more than 50 movie subjects that are used for exhibition in our own theatre, and for exhibition throughout the state. Sportsmen's clubs, wildlife organizations, schools and other groups are constantly requesting the loan of these films for showing at their various activities. Thus it is possible through these movies alone to implant deeply,

State wildlife museum exhibit showing doves in their natural habitat.

especially in the minds of the younger generation, the need for conservation, and the delights that true conservation make possible for all seekers of outdoor recreation and thrills.

Because of the extreme importance of this method of conservation education, it is imperative that these movies be kept abreast of an ultra-modern program of conservation and restoration of our wildlife resources. Unfortunately many of our movies are woefully out of date, worn, and are suffering from over use. It is vitally necessary that in the near future new movies be made or acquired on such subjects as our extensive shrimp industry, fishing, hunting, Louisiana furs, and because of their rapidly increasing number, our state game preserves. A motion picture most certainly should be made entailing development and restocking of these preserves, with such game as deer, wild turkeys, squirrels, etc.

It has been thoroughly proved that visual education is one of the better methods of implanting in the minds of all people the message of wildlife conservation and restoration. Hence it is almost an obligation on the part of any public relations or publicity division to maintain an up to date and satisfactory library of movie films.

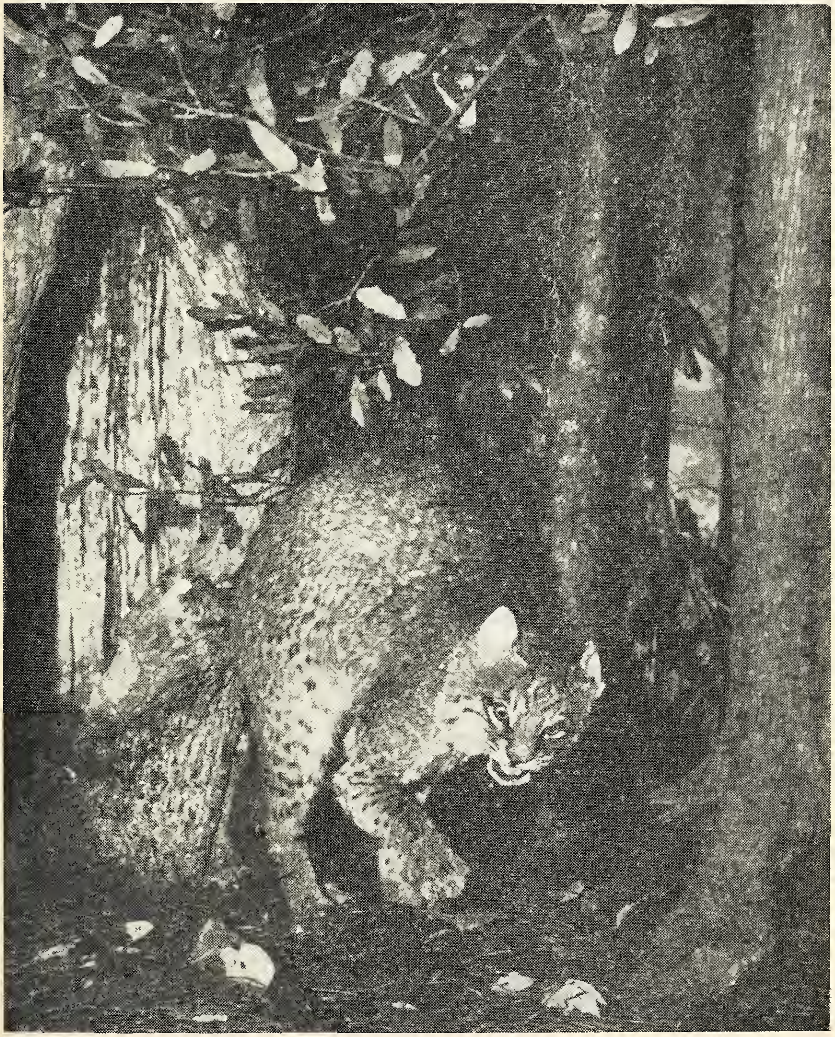
Due to the recent upsurge of television popularity, this division has found it possible to broadcast the message of Louisiana conservation of fish and game more effectively than was possible in former years. Movies from our library have been shown throughout the United States, during the last year and a half, on television programs, and as soon as television outlets become more numerous in Louisiana, it will be possible to get every film this Department possesses on various television programs. This one feature alone would justify a complete renovation of our movie film library and the addition of the aforementioned subjects now so vitally needed.

Another important part of our educational and information activity is the building and maintenance of wildlife exhibits. The development of these exhibits is another obligation of the museum staff. During the years of 1948-49 these exhibits were shown all over the state at fairs and expositions, public meetings, conventions and similar gatherings where such an attraction would be appropirate. Due to the fact that in the late summer and fall of the year many parish fairs are held simultaneously, it has been impossible to arrange exhibits for every occasion, but we have endeavored to schedule these exhibits so as to attend all of these affairs at least once every two years.

During the last two years considerable improvement has been made in the exhibition rooms of our museum. One of these rooms has been completely rebuilt and dedicated to the exhibition of wild waterfowl subjects. Here specially lighted display boxes have been installed, with artistic and natural appearing backgrounds of each specimen's habitat, have been arranged. The result is that now this room is one of the most popular in the entire museum. It is hoped that in the future similar work can be done in other rooms in the museum and thus add greatly to the attractiveness of this institution as a whole.

In the latter part of 1945 this division entered into a joint agreement with the State Department of Agriculture for the construction of a migratory waterfowl exhibit in the permanent

Louisiana State Exhibit building located on the fairgrounds in Shreveport. This exhibit was completed late in 1947 and is considered one of the most complete and attractive migratory waterfowl exhibits in the nation. It will be necessary before this year is out to refurnish this exhibit to keep it as attractive as it was at first intended, and arrangements are now being made for this needed repair.



Louisiana bobcat mounted in natural habitat background. A specimen on display at State Wild Life Museum.

Exhibit room in the state wildlife museum in the Presbytere in New Orleans, in which only wild water fowl specimens are shown.

New Publication

In September 1948 this division inaugurated a new publication called the "LOUISIANA CONSERVATIONIST" and abandoned the then in use publication called *Louisiana Game, Fur and Fish.*

The "LOUISIANA CONSERVATIONIST" is a 28 page "slick" publication and contains pictorial art and hunting and fishing stories of a kind that will tend to develop the desire for conservation and law observance among its readers. Starting out with a mailing list of slightly more than 12,000, this publication has grown in popularity until, at the present time, 33,000 are now being distributed, and it is almost a certainty that the mailing list will have grown to approximately 40,000 by the end of 1950. This magazine is sent to every member of sportsmen's clubs, wildlife organizations, and similar groups throughout the state. It is also distributed in schools, to all members of the State Legislature, and all other executives of the state administration. In addition, it is mailed to thousands of men and women throughout the state who have evidenced an interest in conservation education.

In the year and a half of its existence the "LOUISIANA CONSERVATIONIST" has risen to third place in the nation among publications of this sort, and it is the determined resolve of this division to raise it even higher in national regard, if possible.

Printed Matter Needed

There is a vital need now in this division for new and up to date printed material on each phase of our wildlife conservation activities. At the present time we are able to distribute only material that has been in print for a number of years and much of its is greatly out of date. Due to the fact that nothing new has been printed for several years, much of the material that could be distributed formerly is now exhausted and should be replaced with new pamphlets and booklets that are in constant demand.

One example of this antiquated material is the fishing map (of which there are only a few left) that is in daily demand. This map was printed considerably more than a decade ago and bears the name of the late William G. Rankin who was at that time Commissioner of Conservation. It is urgent that a new map be secured and printed. As there is a fee covering the cost of each of these maps paid by the recipient, these maps, that are so popular and in constant demand, eventually cost nothing, hence it would seem advisable that new and up to date maps be secured as soon as possible. It would also seem advisable that a publication dealing with predators be compiled and printed inasmuch as the Department's predator control unit has been doing such splendid work throughout the state. There is undoubtedly a vital need for educational matter dealing with predatory animals that prey on our state's fish and game.

New Books

At the present time there are two publications "in work" to be paid for by funds already dedicated for their publication. One of these books is a complete revision of the former book dealing with fishes and marine life; the other is a book dedicated to the Louisiana fur industry; it is hoped to have both of these publications off the press by the end of this year.

One of this division's publications that has become exhausted and was extremely popular was entitled *Birdlife of Louisiana.* As the replenishment of the supply of these books would only entail the reprinting of the specified number and would not need to be compiled and edited, it would seem advisable that a new supply of this publication be obtained.

Specimen of deer shown in State Wild Life museum.

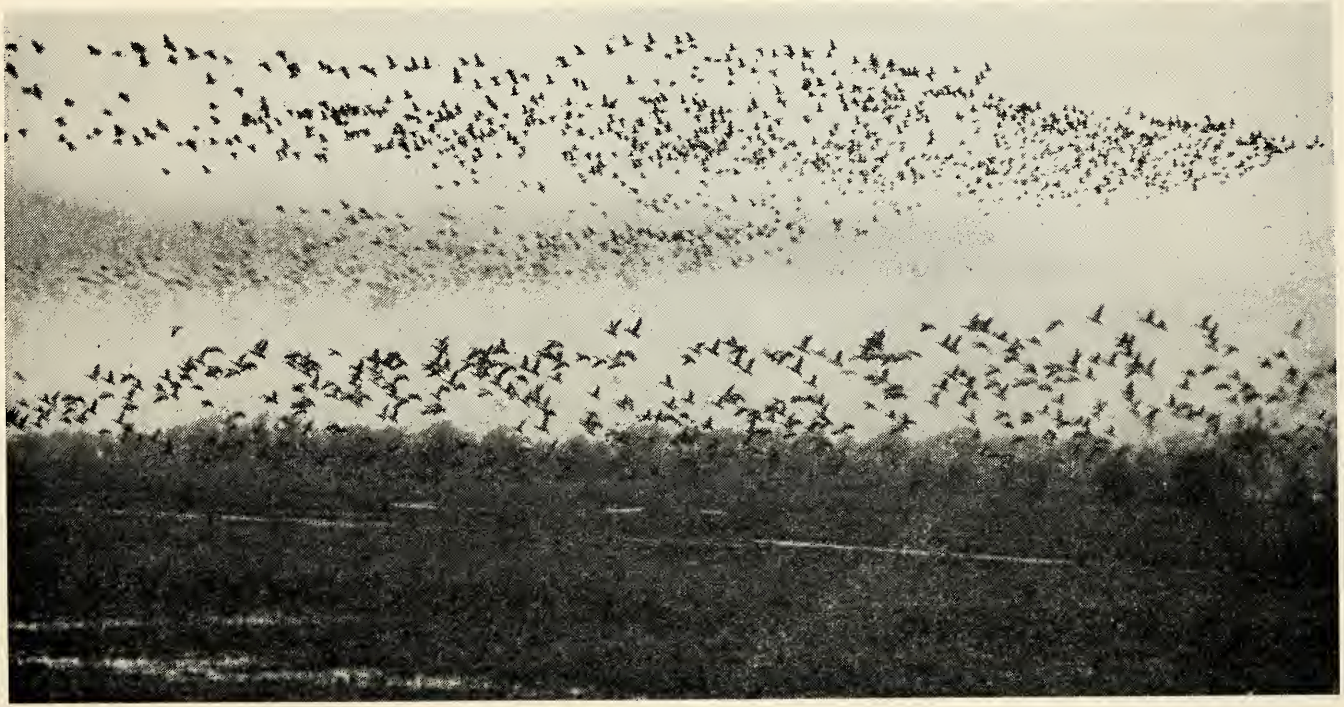
Press Releases

During the past biennium many thousands of stories have originated in this division pertaining to conservation education, official proclamations, and orders of the Commissioner relative to conservation of our natural resources. These stories are distributed to all daily and weekly publications throughout the state, to the various press associations, and to the radio stations. Our relation with the press and radio has been extremely cordial, and we have found much cooperation from these news distributing agencies with regard to the use of story material and pictorial art.

During the last two years I have spent considerable time making personal contacts throughout the state, addressing meetings of wildlife organizations, civic groups, school groups, conventions, etc., preaching the gospel of fish and game conservation, and stressing the overall need for observance of Louisiana's fish and game laws. These contacts and personal appearances are proving more valuable with each succeeding day and it is encouraging to learn that there is a steadily developing increase, throughout the entire state, of sentiment against game law violators and for the sincere conservation of all of our natural wildlife resources.

We have endeavored to use every possible source for the distribution of conservation education. We have been fortunate in being able to interest numerous nationally distributed and popular publications in Louisiana wildlife with the result that many of these, such as, "Sports Afield," "Field and Stream," "The Outdoorsman," and similar publications have carried stories on Louisiana's fish and game, this department's restocking program, and other phases of our conservation efforts.

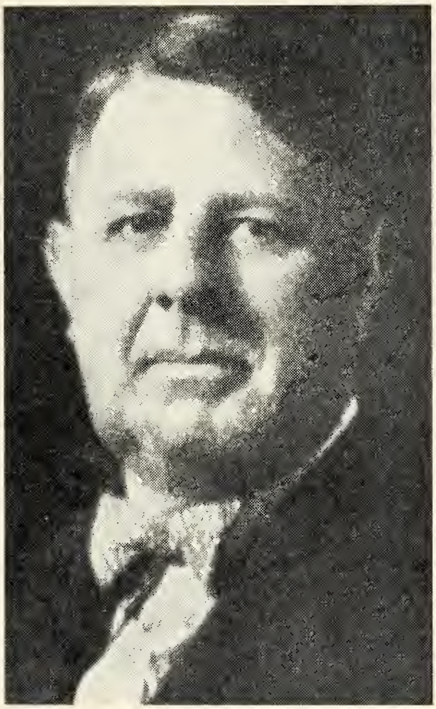
We have assisted major moving picture companies in photographing our wildlife with the result that much of our pictorial and wildlife beauty has been included in nationally distributed films. We have also assisted many of the famous outdoor writers of America in obtaining Louisiana data and pictures for their articles, and we have cooperated to the full extent of our ability in the promotion of feature stories and editorial articles looking to better conservation education. In short, we have endeavored to leave no stone unturned in impressing on the mind of every man, woman and child in this state the now critical need for sincere conservation in all its phases pertaining to wildlife restoration and protection.



Flight of blue geese over a rice field near Abbeville, showing only a few of the many thousands that fed in that locality last winter.

FUR AND REFUGE

ARMAND P. DASPIT, *Director*



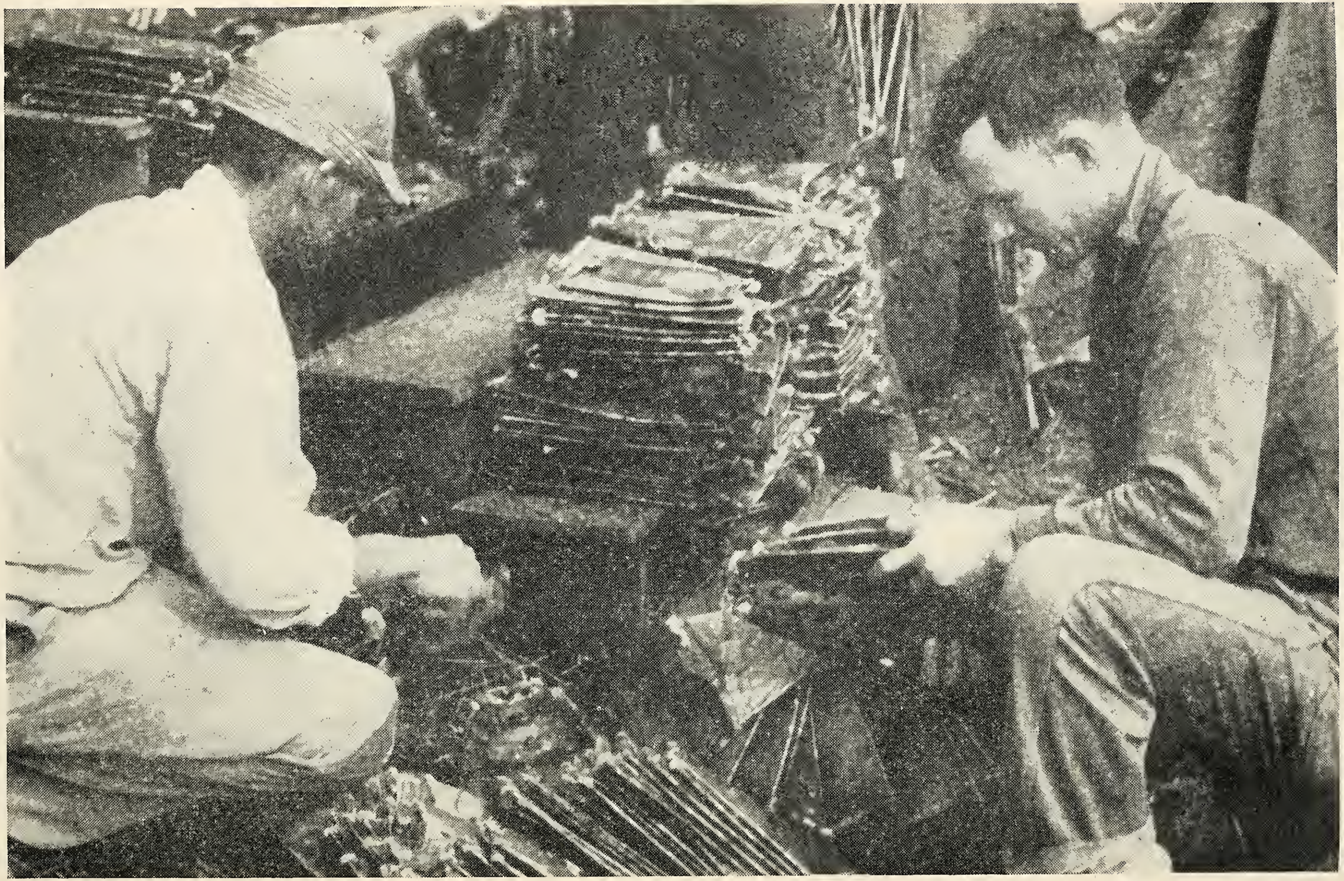
Armand P. Daspit

I SUBMIT herewith the Biennial Report of the Fur and Refuge Division for the years 1947-1948 and 1948-1949.

The fur crop in Louisiana is a valuable natural resource, and the fur trade in the United States in all its branches is one of our important commercial industries. According to Dr. Frank G. Ashbrook, in charge of wild fur animal investigations, branch of wildlife research, Fish and Wildlife Service, Washington, D. C., the annual raw fur crop in the United States is worth from $100,000,000 to $125,000,000.

The take of fur animals in Louisiana for the seasons 1947-1948 and 1948-1949 has been far below par due to excessive drouth and bad trapping seasons and to warm weather. There were only five good trapping days during the 1948-1949 season out of the seventy-five trapping days.

Whereas the muskrat crop has shown a very appreciable loss, the nutria has shown very little loss. If favorable weather had prevailed, the nutria crop would have shown at least a gain of twenty-five per cent. However, although the fur take was small in the 1948-1949 season, plenty of breeding stock was left in the marshes and the pay off should be very much larger in the years to come.



Counting and packing furs in camp on Marsh Island preparatory to shipping to New Iberia Warehouse.

Another blow to the past season's trappers was the slump in the price of the fur. Although this was not unexpected, it nevertheless was deeply felt. Because of bountiful crops in recent years and the heavy importation of fur from Europe (Russia) the fur market is over stocked, and there is not enough demand for furs to keep the price up. As a result the trapper got twenty to thirty per cent less this year for prime pelts than he did last season.

Dr. Ashbrook says that too many improperly handled furs are received in the raw fur markets. This results from the pelts being carelessly removed, either through lack of knowledge of how to skin the animals properly, or through wasteful negligence on the part of the trappers. Poor preparation of fur skins brings disappointing returns. Such waste can be reduced by following certain methods. To warrant the current, top-market price, the fur pelt should be prime, properly skinned, stretched, and dried, and free from dirt and excessive flesh and fat.

We have sought to make some correction in the handling of the State's fur, taken by the trappers on the State's game preserves by "rough grading," taking the mice and pieces and badly prepared pelts out of the good lot, and selling them separately on the basis of ten cents each, giving the trapper credit for sixty-five per cent of this sale. This has reduced to a very large extent the close trapping to the nests, and the unethical trapper, who attempts to put in many pieces into lots of good fur, and seeks to get credit for a well prepared pelt. This method of "rough grading" was established some years ago and it has proved of great benefit to the industry as most of the large land owners have adopted this plan and found it very beneficial.

To insure a good crop of fur from trapping land, the land should be properly taken care of at all times, three-cornered grass, the favorite muskrat food, should be planted, and small ditches dug to relieve the marshes of stagnated water caused by decayed vegetation during drouth. Fresh water always keeps the marshes healthy.

Muskrats propagate very rapidly and unless their numbers are reduced periodically, they over-populate any tract of land favorable to their growth. Since they live on roots of grasses, when there are too many rats on a piece of land they eat the roots faster than the grasses can replace them. Before long the

A Typical Louisiana Trapper.

prairie is dead, or "eaten up", and the muskrats suffer from malnutrition and its accompanying diseases. Many of the 'rats move to other lands; the rest remain and die.

The prairie, with no roots to hold its soil in place, sinks and becomes unsuitable for the growth of the kind of grasses desired by 'rats. The worst places become ponds; on the rest, other grasses slowly grow. Few 'rats are to be found in the vicinity. In time, the roots of these other grasses spread, and support the soil, and in about five years the prairie is again able to produce the grasses desired by muskrats for food and the rats begin once more to increase on this land. It is therefore necessary that the land owners employ a sufficient number of trappers each year to take enough rats off their land to save it for the next trapping season. Of course a sufficient number of "seed rats" should be left on the land in order to insure a good crop for the next season.

"Marsh Hare"

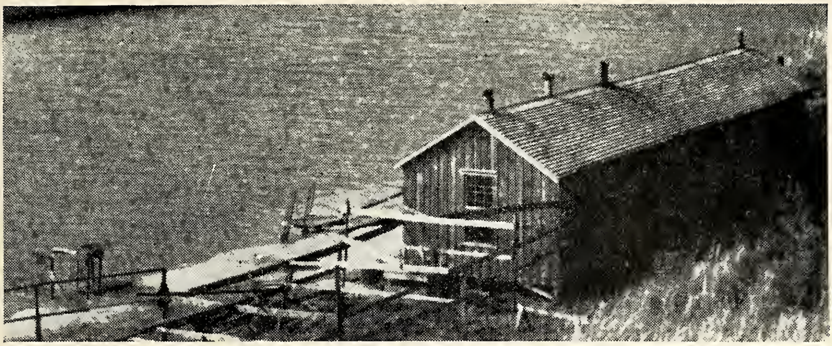
The consumption of muskrat carcasses, legally known as "Marsh Hare" in Louisiana, has not met with enthusiastic approval, due to the fact the muskrats are usually trapped during the night, the carcasses lying in the traps from ten to twelve hours a day in the most isolated sections of our state where refrigeration is not accessible. Thus it will be noted that usually the carcasses are not very fresh and are not suited for human consumption, when picked up and besides, we have so much to eat in Louisiana that comes from the marshes, such as oysters, shrimp, fish, frogs, turtles, crabs and crayfish, that it is not necessary to resort to eating muskrats, or "Marsh Hare" as some call it.

Louisiana Nutria or Coypu

"Nutria"

The Nutria seems to be the coming fur for this section of the country. These animals were imported into Louisiana in 1930 from Buenos Aires and this South American animal has done very well since its importation. They are very prolific and easy to trap. They do not come in conflict with any of our existing fur animals and consume only the grasses and weeds that the muskrats do not eat. They eat the coarser grasses and graze on the surface like a cow or sheep. When that surface is eaten bare, they move off to greener pastures and allow the eaten up pasture to be restored. The pelts average about $3.50 each.

Captain Von Lubbe, Fur and Refuge Division's pick-up man, writes out the tickets for pelts of William Hebert, Theal, Louisiana.



Typical trapper's marsh camp and drying rack.

We trap them with the same trap that we use in trapping muskrats. They are usually caught by the feet and are not fighters when you approach the trap, as are the raccoon and mink. Trappers usually place a forked stick across the back of the neck, jam the face into the marsh, and release the smaller animals.

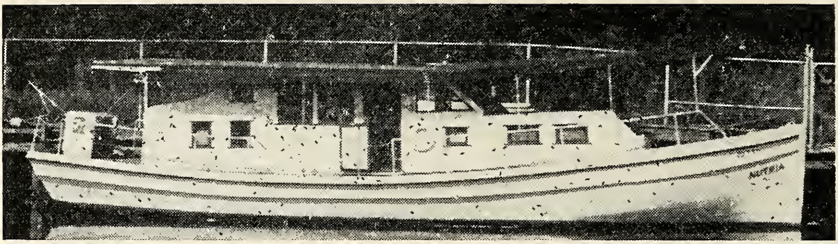
Our local buyers will not accept a nutria skin that stretches less than twenty inches, so it is to the interest of the trapper to release the small ones and in that way propagating stock will always be on the increase.

Below is a comparison of the nutria take in Louisiana from the 1943-1944 season through the 1948-1949 season:

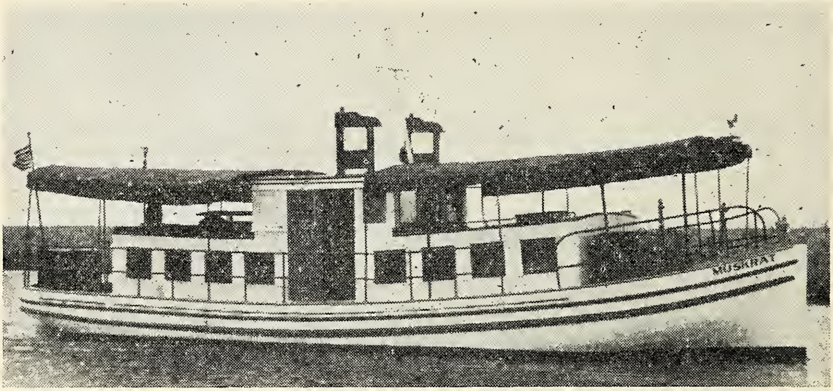
1943-1944	436
1944-1945	902
1945-1946	8,784
1946-1947	18,015
1947-1948	28,176
1948-1949	26,738

"Beaver"

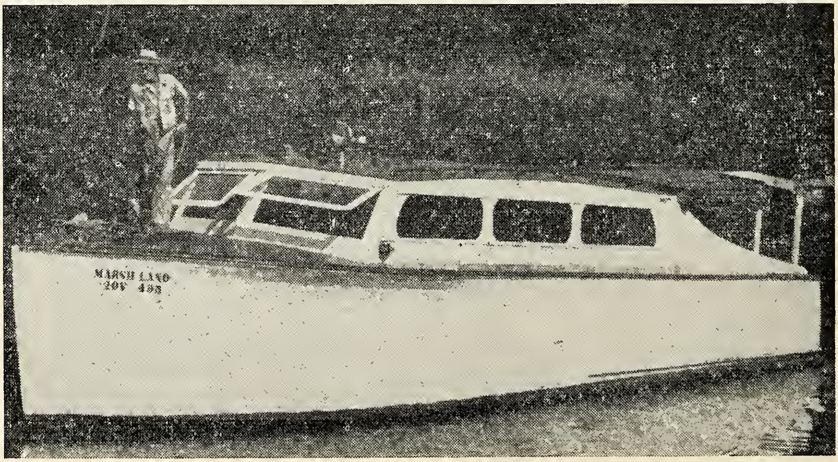
Whereas we have beaver in Louisiana there are no areas in which they would thrive to any great extent. We have made attempts to distribute a few in areas where we thought they would thrive, but they do not seem to remain in any one place. They are great roamers. Every time we attempted to plant them in an area, we have found them fifty or one hundred miles from



Patrol Boat "Nutria," Fur and Refuge Division.



Patrol Boat "Muskrat", Fur and Refuge Division



Patrol Boat "Marshland", Fur and Refuge Division.

where they were planted, and stopping up drainage in many of the fields, causing us a great deal of concern with farmers in the state. Although we have had a closed season for twenty years on beaver, and they have propagated to some extent, we do not look upon their increase with any degree of enthusiasm.

"Mink"

Louisiana leads all other states in the Union in the production of mink pelts. Aside from the otter skins, the pelt of the mink is the most valuable fur taken in our State. It occurs throughout Louisiana, being found in greater numbers, however, in heavily wooded water-bottoms and in cypress and tupelo swamps. The minks found in these sections are more valuable than those inhabiting the coastal marshes as the "woods mink" has a darker coat and the fur is finer.

The leading mink-producing parishes, in the order of their importance in numerical production, are: Terrebonne, St. Mary, Lafourche, Cameron, Vermilion, Assumption, Plaquemines, St. Bernard, Calcasieu, Jefferson, Livingston, Tangipahoa, Natchitoches, DeSoto, Iberville, Rapides, Bossier, Caddo, Richland, St. John, and St. James. There is not a parish in the State where this fur animal is not taken.

"Otter"

The otter is a carnivorous aquatic mammal belonging to the lutrine section of the Mustelidae family, a group that includes the minks, weasels, skunks, badger and marten. It has a long slender body, very short legs, stout tapering tail, and a flattened head. The otter is not only the largest fur animal in our fauna, but has a pelt that commands the highest price. The pelt is of a rich dark brown color with a fur of fine quality.

The principal otter producing parishes of Louisiana are Terrebonne, St. Mary, Cameron, Plaquemines, Iberville, Ascension, Livingston, East Carroll, Iberia, Vermilion, Lafourche, Assumption, Pointe Coupee, St. Martin, Washington and West Feliciana.

"Opossum"

The opossum is prized first for its fur and second for its flesh; especially among the colored folk 'possum and sweet potatoes is considered a choice dish.

The pelt of the opossum is used mostly for trimming.

The opossum is distributed generally throughout the State, being found in numbers in every one of the sixty-four parishes, including Orleans. It seems to center in greatest numbers in Terrebonne, Lafourche, Calcasieu, Jefferson, Natchitoches, Plaquemines, Beauregard, Assumption, Rapides and Allen.

"Raccoon"

The Louisiana salt water marsh raccoons have increased in numbers to the point of becoming a nuisance, therefore on Monday, December 5th, 1949, Commissioner Ernest S. Clements issued an order to the effect that the yellowish, harsh furred raccoon of the marshes was declared to be an outlaw quadruped in the coastal parishes and may be destroyed at will. This is both an economic and a wildlife conservation measure.

Louisiana Raccoon.

The marsh raccoon is an outlaw only in the parishes of St. Tammany, Orleans, St. Bernard, Plaquemines, Jefferson, Lafourche, Terrebonne, St. Mary, Iberia, Vermilion, Cameron and Calcasieu. In these parishes, and in no others, it may be killed at any time.

Trappers of the state have lost tremendous sums of money during the past few years by depredations of the raccoon against trapped furs and young animals. The marsh 'coons have learned to rob traps of captured animals, destroy muskrat houses and kill the young; destroy the nests and eggs of ducks, rails, gulls, terns and all ground nesting birds and even to dig up the eggs of terrapin and sea turtles, hence the order outlawing these animals in the coastal parishes.

The raccoon found in the vast hardwood lands and the cypress and tupelo swamps is not outlawed. It has a darker pelt than the salt water 'coon and brings a much better price.

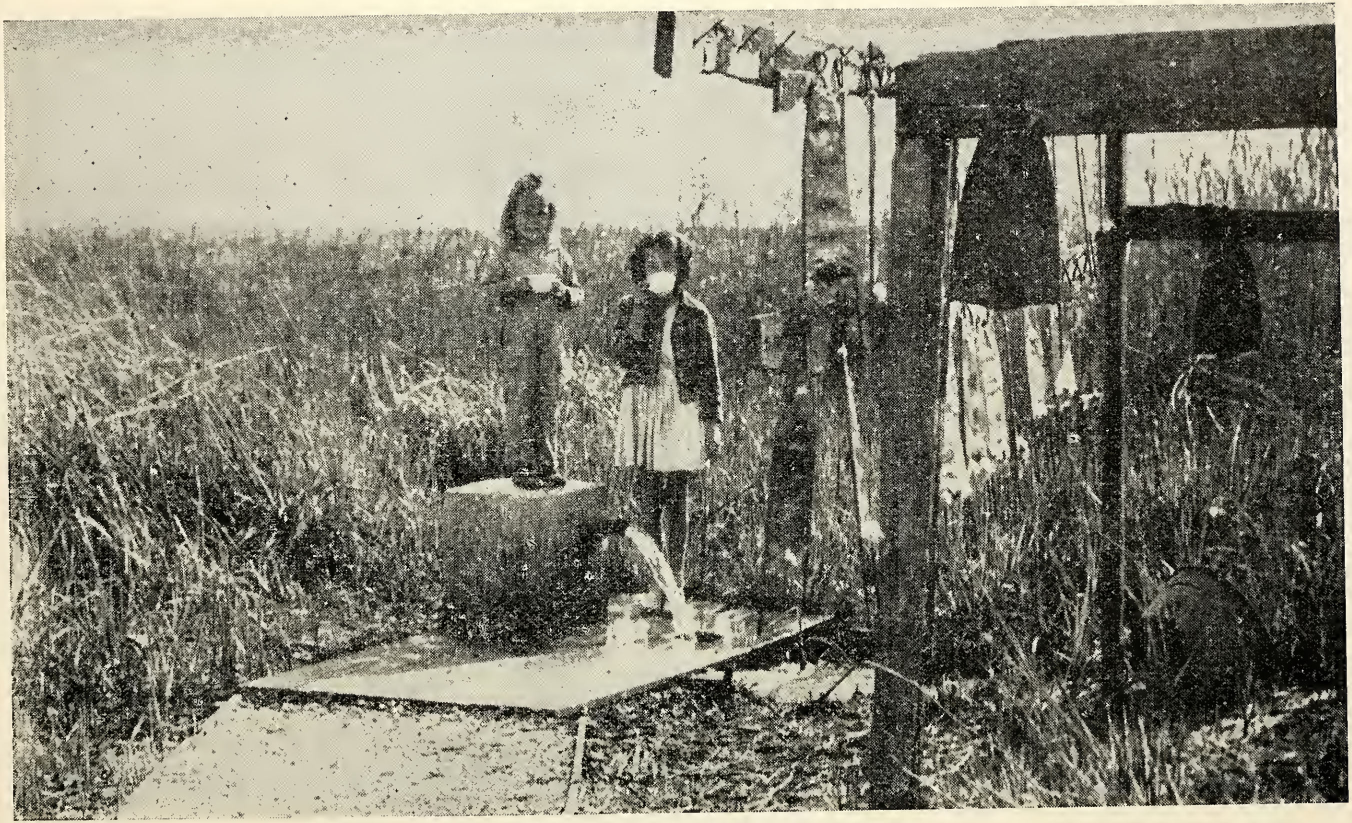
The raccoon is a thickly built animal with a coat of long, rather coarse, greyish-brown hairs, black at the tips, underlain by a fine fur characterized by its length, softness and thickness; it has short ears, and a bushy black-and-white ringed tail. It averages 32 inches in length and possesses a long, pointed snout, and a white face with a characteristic black area on each cheek surrounding the eye.

Below is listed the fur take in Louisiana and the approximate prices at point of severance in the 1947-1948 and 1948-1949 seasons:

The Alligator

The Louisiana alligator is still very popular and there is quite a demand for the skins by dealers and manufacturers to be made into bags, shoes, belts, wallets, luggage, etc. The Louisiana alligator skin is preferred because of the absence of "corn marks" that are found on the Florida and Mexican skins; it is more pliable and the scales are more artistically curved and shaped. Only the "bellyskin" is used for manufacturing purposes.

The alligators mate during the latter part of February and the first of March. This depends a great deal upon the weather, continued warm days, and whether or not it has been a cold or mild winter. The Louisiana alligator hibernates during the



Fresh water well on Marsh Island

winter. However, on warm days during December and January, these reptiles, especially the larger bull specimens, will be found sunning themselves along the bayous.

Mating is accompanied by a great deal of fighting on the part of each, slapping one another with their long, heavy tails; the cow using not only her tail but jaws, even if the attentions of the bull are not distasteful. According to some of our Marsh-dwellers cows do not mate every year, and young cows, those of about 5, 6 and 7 feet, do most of the fighting. Old cows do not appear to be so pugnacious. The bull stays with the cow only two or three days, then leaves for virgin territory. The copulating period extends through March and April to some time in May.

The alligator perpetuates its race by laying eggs from which the young emerge. Nesting starts by the first week in June. This work is done entirely by the female, as the male, after the mating season, takes no interest in the propagation of his species.

Observations tend to show that a five-foot alligator will lay about 25 eggs; a six-footer will lay about 35 eggs, and a seven-footer will lay up to 40 eggs. This seems to be the maximum number laid.

The exact period of incubation has not been worked out, however it is estimated to be about nine weeks.

COMPARATIVE TAKES OF ALLIGATORS IN LOUISIANA

Season	Less than 5 feet	Less than 10 feet	More than 10 feet	Total
1947-1948	22,386	10,543	59	32,988
1948-1949	24,830	10,931	35	35,796

1947-1948 SEASON

Muskrat	5,794,317	@	$ 1.50	$ 8,691,475.50
Nutria	28,176	@	3.00	84,528.00
Mink	153,120	@	15.00	2,296,800.00
Raccoon	126,933	@	1.00	126,933.00
Opossum	31,744	@	.70	22,220.80
Skunk	1,415	@	.70	990.50
Otter	5,078	@	18.00	91,404.00
Fox	2,528	@	.50	1,264.00
Cat	70	@	.50	35.00
Miscellaneous	679	@	.50	339.50
Total	6,144,060			$ 11,315,990.30

1948-1949 SEASON

Muskrat	2,948,281	@	$ 1.10	$ 3,243,109.10
Nutria	26,738	@	3.50	93,583.00
Mink	91,541	@	8.00	732,328.00
Raccoon	104,034	@	.70	72,823.80
Otter	2,222	@	12.00	26,664.00
Opossum	23,713	@	.50	11,856.50
Skunk	1,144	@	.50	572.00
Fox	1,727	@	.50	863.50
Cat	222	@	.50	111.00
Wolf	6	@	.50	3.00
Miscellaneous	759	@	.50	379.50
Total	3,200,387			$ 4,182,293.40

REVENUES RECEIVED IN THE FUR AND REFUGE DIVISION IN THE 1947-1948 SEASON

Resident Fur Dealer's Licenses	42	@	$150.00	$ 6,300.00
Non-Resident Fur Dealer's Licenses	4	@	300.00	1,200.00
Resident Fur Buyer's Licenses	330	@	25.00	8,250.00
Non-Resident Fur Buyer's Licenses	7	@	100.00	700.00
Trapper's Licenses net (Less Sheriff's Commission)	9,899	@	2.00	19,798.00
Total amount of Tax collected from Fur Dealers and Fur Trappers				80,441.33
Game Warden's Services				2,900.95
Total				$119,590.28

The Fur and Refuge Division does not receive one penny of the above revenue. These revenues are turned over to the general fund of the Department of Wild Life and Fisheries.

Total Revenues received from the sale of furs taken from the State Game Refuges, Marsh Island, State Wildlife and the Rockefeller Refuges:

Total amount of fur sales	$360,953.92
Less trapper's 65%	234,620.04

Department's 35%	$126,333.88
Department's 35% of revenues received from the sale of furs taken from Pass-a-Loutre Refuge	6,477.85
Department's 35% of revenues received from the sale of furs taken from St. Tammany Refuge	761.73
Department's 25% of revenues received from the sale of alligators taken from Marsh Island	681.44
Department's 25% of revenues received from the sale of alligators taken from Rockefeller Refuge	57.61
Revenue received from pasturage on the State Game Refuges	1,389.00
Total	$135,701.51
Grand Total	$255,291.79

REVENUES RECEIVED IN THE FUR AND REFUGE DIVISION IN THE 1948-1949 SEASON

Resident Fur Dealer's Licenses	40	@	$150.00	$ 6,000.00
Non-Resident Fur Dealer's Licenses	1	@	300.00	300.00
Resident Fur Buyer's Licenses	248	@	25.00	6,200.00
Non-Resident Fur Buyer's Licenses	3	@	100.00	300.00
Trapper's Licenses	8,841	@	2.00	17,682.00
Total amount of Tax collected from Fur Dealers and Fur Trappers				44,231.42
Total				$ 74,713.42

The Fur and Refuge Division does not receive one penny of the above revenue. These revenues are turned over to the general fund of the Department of Wild Life and Fisheries.

Total Revenues received from the sale of furs taken from the State Game Refuges, Marsh Island, State Wildlife and the Rockefeller Refuges:

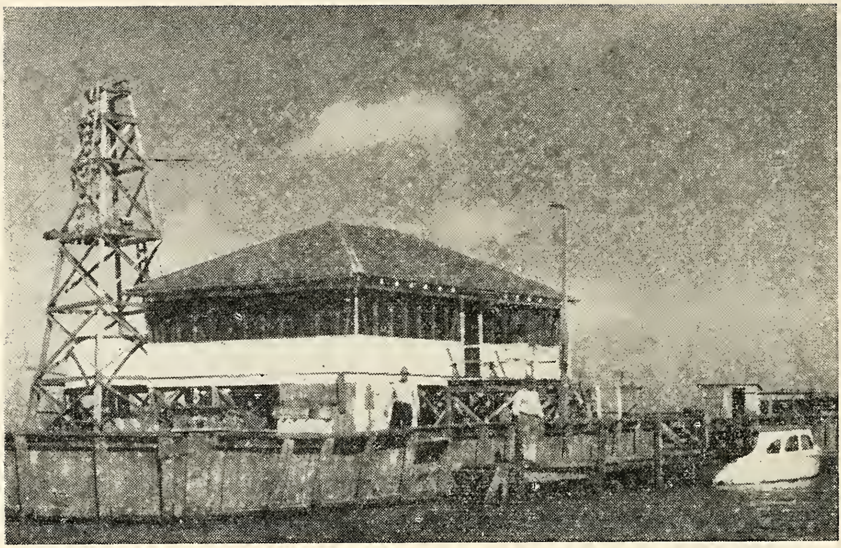
Total amount of fur sales	$181,442.76	
Less trappers 65%	117,937.80	
Department's 35%		$ 63,504.96
Department's 35% of revenues received from the sale of furs taken from Pass-a-Loutre Refuge		1,365.74
Department's 35% of revenues received from the sale of furs taken from St. Tammany Refuge		460.89
Department's 25% of revenues received from the sale of alligators taken from Marsh Island		387.09
Department's 25% of revenues received from the sale of alligators taken from Rockefeller Refuge		319.25
Revenue received from pasturage on the State Game Refuges		1,512.00
Total		$ 67,549.93
Grand Total		$142,263.35

Wildlife Sanctuaries in Louisiana

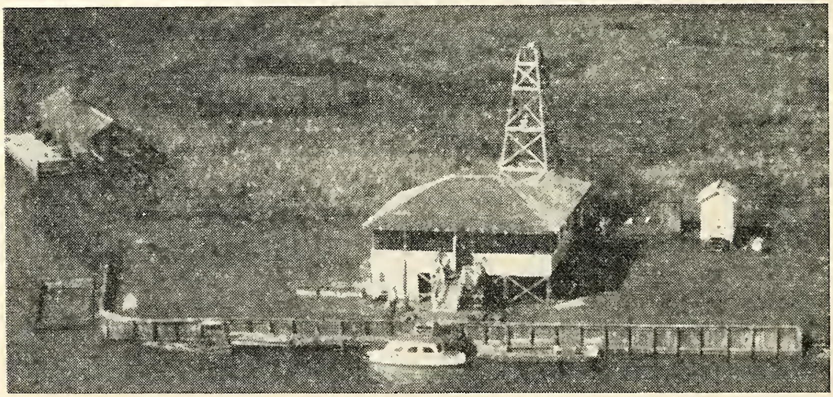
The geographic position of Louisiana makes it an important bird state and each year it affords a vast assembling place for great hoards of migratory waterfowl and shorebirds. To protect these yearly visitors from possible extinction, has long been the aim of the Department of Wild Life and Fisheries. Our wildlife sanctuaries are the largest in the world, and, as few people know, were the first migratory waterfowl refuges to be established and owned by any state or national government.

Long before the Government or any other agency of any consequence had taken an interest in migratory waterfowl, the State of Louisiana was actively guarding these winter visitors. Louisiana has been a harboring place, a refuge, a winter home for fifty per cent of the waterfowl of North America as far back as man can remember. If other states had done just a small share of what has been done in Louisiana for the perpetuation of waterfowl, no scarcity would exist.

There is an abundance of blue geese, in fact, so abundant that complaints are coming to the Department that unless something is done to decrease these in numbers, our marshes, in a few years, will be completely eaten up and, of course, other



Warden's Camp, Bayou Firman State Wild Life Refuge.



Aerial View of Warden's Camp, Trappers' Camp, Bayou Firman, State Wild Life Refuge.

waterfowl will suffer in proportion, and those that formerly spent the winter with us, will go to Mexico and Central America for food.

The following migratory waterfowl refuges are located in Louisiana:

MARSH ISLAND (Russell Sage Wildlife Refuge) is located in Iberia Parish and comprises 79,000 acres. On this refuge will be found Mallards, Golden-eyes, Blue Wing Teals, Green Wing Teals, Scaupes, Ringnecks, Canvasbacks, Pintails, Mergansers and Baldpates; Snow, Blue, Canadian and White-Fronted Geese; Rails, Marsh Hens, Blue Herons, Snowy Egrets, Ward Herons, Louisiana Herons, Snipe, Yellow crown Night Herons, Cormorants and Pelicans. There are also muskrats, raccoons, mink, otter, nutria, alligator and deer.

In the past two years we have carried on a duck food planting program which has proven very satisfactory. We have transplanted banana water lily, wild celery, gray duck moss, and widgeon grass, from areas where they were plentiful, to areas that were barren.

A new patrol boat the "Marshland" was built, and we recently purchased the "Nutria". Both these boats will be used for patrolling.

A hoist was built on Marsh Island for repairing all patrol boats. All of our boats are kept in first class condition at all times.

Four new trapper's camps were built and all existing camps repaired.

Our superintendents and wardens diligently patrol our game preserves at all times.

The following are regulations covering all State Game Refuges as prepared by this office:

1. No fire arms of any kind are permitted on the refuges.
2. No hunting of any kind is permitted on this property by anyone.
3. Trapping permitted *only* by the employees of the Depart- of Wild Life and Fisheries.
4. No intoxicating liquors of any kind are permitted on this property.
5. No gambling of any kind is permitted on this property.
6. Speed boat racing prohibited in the streams on the refuges, and no trespassing of any kind is permitted.
7. Waste oils and pollution must be kept to a minimum.
8. Excessive drainage of property is prohibited.

LOUISIANA STATE UNIVERSITY LIBRARY

Muskrat mounds in well trapped an cared for lands on State Wild Life Refuge

9. The burning of marshes is prohibited except under the supervision of the Department of Wild Life and Fisheries' superintendent.
10. It is imperative that all Department officials and employees should cooperate in every way possible.

STATE WILDLIFE REFUGE is located in Vermilion Parish and comprises 13,000 acres. This refuge lies west of Marsh Island and adjoins the Rainey Refuge. It harbors the same species of ducks, geese, birds and fur bearing animals as are found on Marsh Island.

The warden's camp on Bayou Firman has been repaired and put in first class condition. Our trappers' camps are located at Cut Off, Bayou Firman, Bayou Tom, Hog Bayou and Hell Hole. All of these camps are maintained in comfortable condition.

The bulkhead around the warden's camp has been repaired and a frame hoist erected for emergency repairs to our patrol boats.

A skiff was converted into an air cooled motor boat for patrolling shallow bayous and lakes where larger boats cannot travel.

There is a large crop of banana water lily and wild celery plants on the extreme western end of Firman Lake from which we obtain enough plants for our annual duck food planting program on State Wildlife, Marsh Island and Rockefeller Refuges.

The Nutria, our newest fur bearing animal, is increasing very rapidly on State Wildlife. We are now catching a few to transplant on our Pass-a-Loutre property.

ROCKEFELLER REFUGE is in Cameron and Vermilion Parishes and comprises 85,000 acres of marshland, with the Gulf of Mexico on the South. There are two modern warden camps and two modern garage apartment camps on the nothern boundary.

There are sixteen trappers camps spread over the refuge, which we maintain in first class condition. The third year of a five-year program of duck food planting of banana water lily, wild celery and widgeon grass was completed this year.

West End Garage Apartment and Warden's Cottage, Rockefeller Refuge, Grand Chenier, La.

Experiments are being made in transplanting three-cornered grass in the semi-brackish and fresh water areas to the northern areas of the Refuge. The results, so far, are very encouraging.

A new patrol mud boat was built and the "Romeo" was repaired.

In a recent resurvey of a portion of the northern boundary of the refuge, about 1,000 additional acres have been added to the refuge. These new boundary lines have been staked and marked.

CHICAGO MILL AND LUMBER COMPANY (formerly the Singer Game Refuge) is in Madison Parish. This refuge, owned by the Chicago Mill and Lumber Company, is leased as a refuge on a ten-year basis. There are approximately 35,000 acres under refuge regulations. The wildlife consists of large quantities of deer and wild turkeys and the few reamining Ivory-billed woodpeckers. The Fisher-Ayers Wildlife Refuge joins it on the south from the Tensas Parish Line.

A new boundary line encircling the Refuge has been marked off and large "NO TRESPASS" signs have been erected at all roads leading into the refuge.

FISHER-AYRES WILDLIFE REFUGE is located in Tensas and Madison Parishes, and is leased on a ten-year basis from the Fisher-Ayres Corporation and includes approximately 22,000 acres. It harbors large quantities of deer and wild turkeys, besides numerous smaller animals.

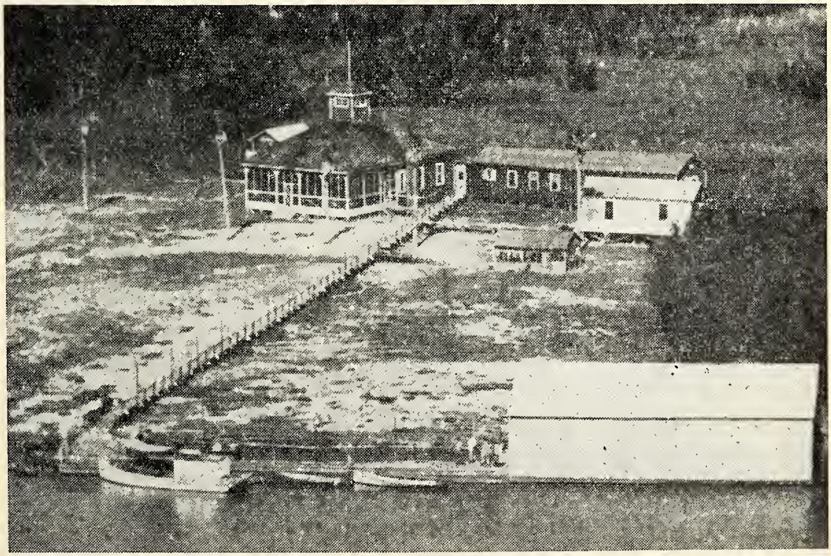
A boundary line encircling the refuge has been marked and painted.

MOREHOUSE REFUGE in Morehouse Parish is owned by the Crosset Lumber Company and is leased to the State on a ten-year basis. This refuge contains 58,000 acres and is the most northerly refuge in this State, being about a mile from the Arkansas line. There are very large herds of deer, a few turkeys and numerous smaller game. It has a perfect system of patrol roads throughout the area. The Crosset Lumber Company is very cooperative with us in maintaining the refuge.

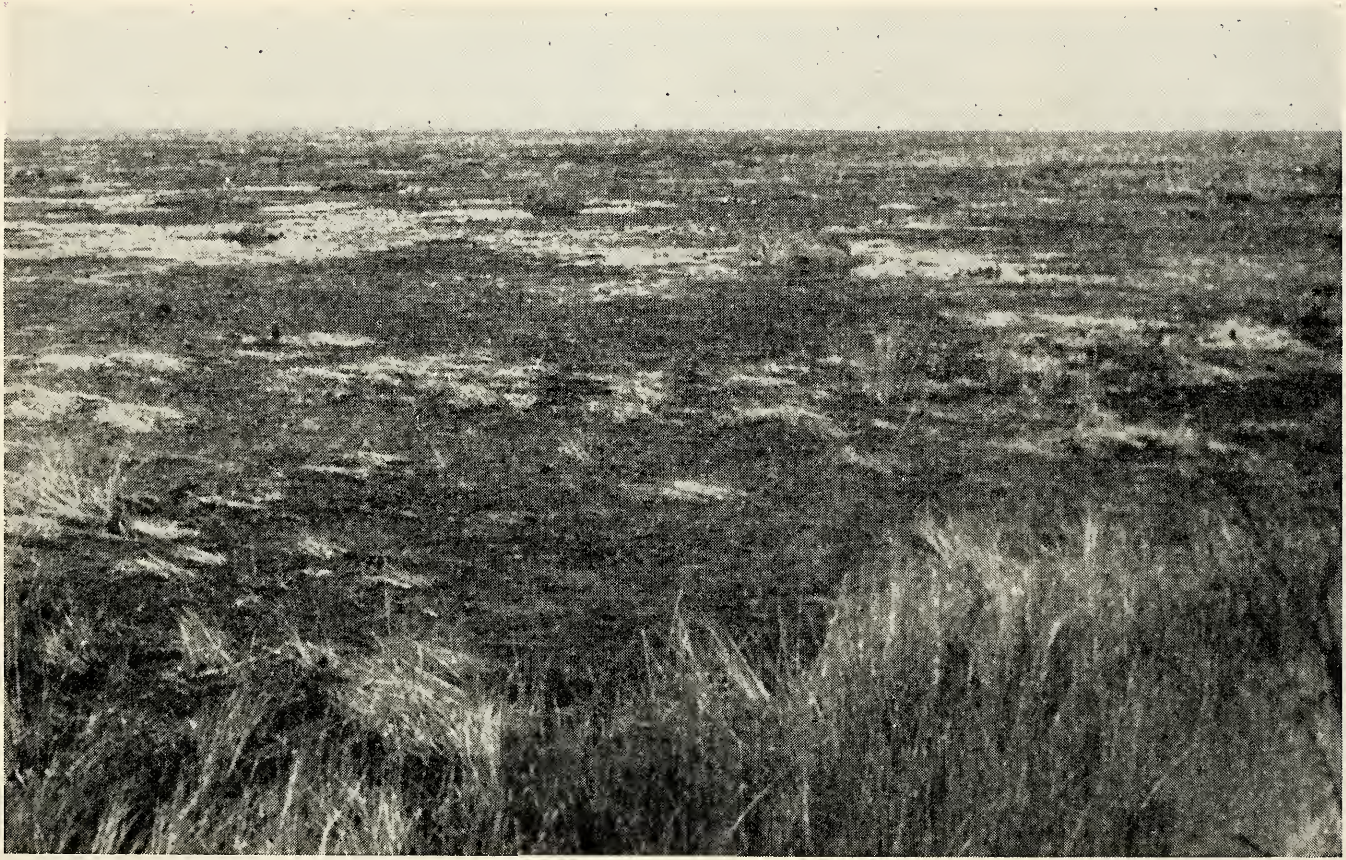
ST. TAMMANY REFUGE is located in St. Tammany Parish and comprises 6,000 acres.

A dam was built across one of the streams between Cane Bayou and Green Point in order to retain sufficient water for both migratory waterfowl and fur bearing animals. This is not very good fur producing property but does harbor considerable migratory waterfowl during the winter.

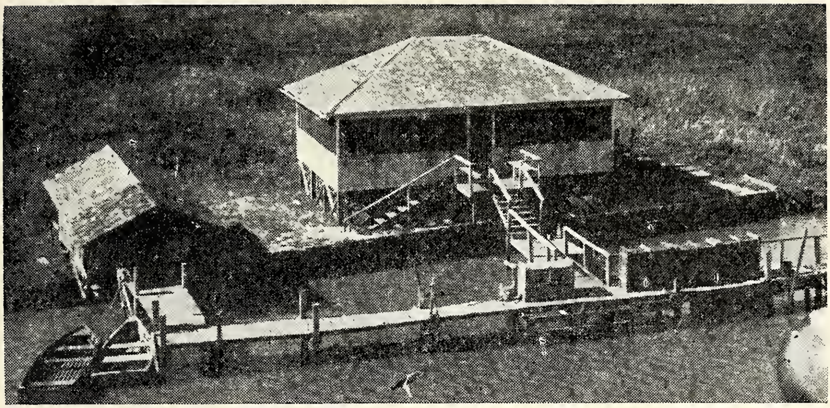
PASS-A-LOUTRE PUBLIC SHOOTING GROUNDS was donated to the Department of Wild Life and Fisheries by an act of the Legislature in 1921. It comprises 66,000 acres located at the mouth of the Mississippi River in Plaquemines Parish. Besides being a desirable public shooting grounds on which the



Public Shooting Grounds and Camp at Pas A'Loutre after Sand Fill and Repairs.



Eat out marsh showing barren ground.



Warden's Camp, Bird Island Bayou, Marsh Island Refuge

State's hunting club is located it has proved to be one of the largest and most profitable oil fields in Louisiana.

The club house, surrounding buildings and wharves which had become greatly deteriorated have been completely repaired, repainted and renovated.

A new gas line has been put in from the well which is four miles away supplying natural gas to the club house and keeper's house free of cost to the Department.

The grounds have been filled in with sand by a suction dredge which has added a great deal to the beauty of the property and comfort of the guests.

All of this has been done in anticipation of the limit of ducks being raised by the Federal Government in the near future in order that the sportsmen might have a place to stay and hunt.

The Nutria Industry

A new multi-million dollar crop has come to Louisiana quite by accident. Twelve years ago six pairs of coypu (Nutria) were brought to Avery Island, near New Iberia, by the late Edward A. McIllheny as an addition to his collection of animals and birds. Two years later a dozen escaped by tunneling out of their pen, and that was the start of new fur industry in Louisiana that in another decade is expected to excede $15,000,000, annually.

Today the strange story of the nutria in the United States is exciting the interest of fur experts, biologists, naturalists and laymen alike as the prospects for the docile and likeable rodent becoming the most valuable fur producter on the North American continent, increase by leaps and bounds.

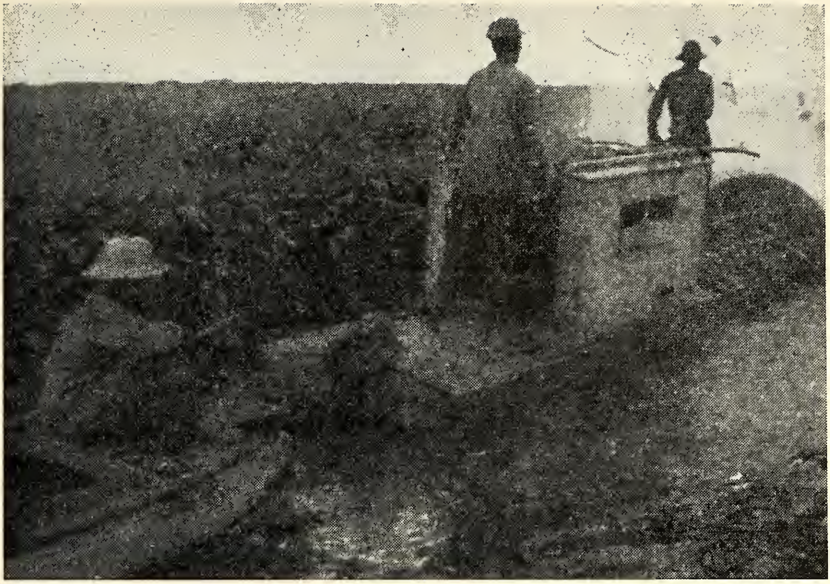
Hardly a day passes that the Fur and Refuge division of the Louisiana Department of Wild Life and Fisheries does not receive some inquiry about this second largest of the rodent family. Virtually unknown in this country until a dozen years ago, the nutria has not only climbed to an enviable place in the fur markets, it has become a great source of speculation and curiosity. Outside Louisiana, that is. Louisiana trappers have come to look upon the nutria as a Godsend, and not as freak.

Along the streams of Argentina and Chile, its native habitat, the coypu is regarded as the South American beaver. In those countries it is known solely as the coypu and the coypu fur is known as nutria. In other words the animal is known as the coypu and the pelt is called the nutria, but the latter word being more convenient for American tongues, this strange rodent has become known almost entirely in America as the nutria.

A little more than 12 years ago as director of the Fur and Refuge Division of the Louisiana Department of Wild Life and Fisheries, I received a letter from a friend in Buenos Aires, Argentina, suggesting that he send me a few coypu and offering a brief description of this animal.

Fearful that I might be the means of liberating a menace to the Louisiana muskrat that was bringing an annual crop to Louisiana trappers worth $10,000,000 to $15,000,000 annually, I wanted no part of Argentina's coypu, but knowing the late Edward A. McIllheny's penchant for strange animals to install on his Avery Island refuge, I turned the Argentine's letter over to Mr. McIllheny, and the latter promptly wrote requesting that the coypu be sent to him. In due time they arrived and were installed in the Avery Island Jungle Gardens, in huge cages made of heavy wire. Here the six pairs of coypu lived in apparent contentment and health, with their steadily increasing number of progeny.

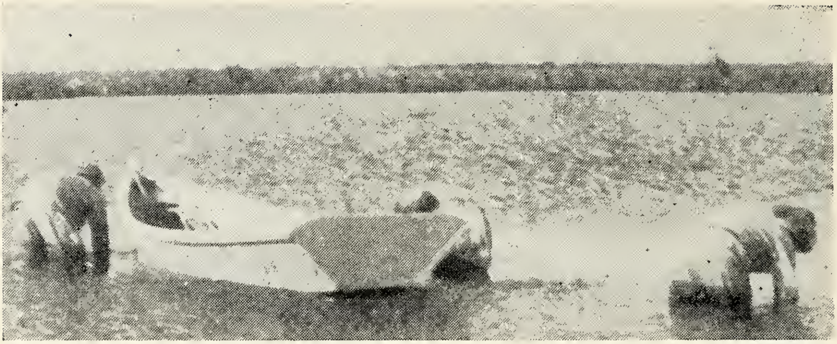
Two years later a dozen coypu dug out one night and that was the start of Louisiana's newest and potentially richest fur crop. For several decades Louisiana has produced more furs



Ditchdigger clearing patrol ditches on game preserves.

than all the other states of the Union combined, more even than the Dominion of Canada and Alaska, and in ten years more, thanks to the coypu, or nutria as it is now generally called in the Louisiana marshes and on the Louisiana fur marts, that annual fur crop will be doubled, without cost to the state and without the slightest damage to its other fur bearing animals.

That the nutria is no menace to the muskrat is evident. The muskrat is polygamous, thrifty and prolific in spite of floods, high tides and the 250 traps allowed by law to each of Louisiana's 15,000 trappers in the open season. The nutria, or coypu, loves the marshes and thrives there, and strange to say, does not in any way interfere with muskrat production, as the food required by the nutria is entirely different from that of the muskrat. There is plenty of range and graze in Louisiana's marshes for both the muskrat and the nutria. The nutria prefers fresh water marshes over salt water or brackish marshlands, while the reverse is true of the muskrat. Nutrias are entirely vegetarian, and under natural conditions feed preferably on water plants, bulbs and roots. They may also be successfully raised in pens and under proper regulations propogate plentifully.



Crew gathering duck food for replanting.

While the largest muskrat reach only a weight of three to three and a half pounds, the coypu, or nutria, easily attains a size of 25 to 30 pounds, thus a much bigger pelt is obtainable from the nutria than the muskrat, and, the furriers say, a much more valuable pelt regardless of its size. Muskrat skins vary in color to a great degree. Some are light in shade or of mixed colors; others are of a deeper hue, and there are skins of varying shades in between. The nutria skins are almost universally the same color, hence they are much easier matched and the manufacturing furrier finds them of greater value for this reason alone. In addition there is a heavy coat of guard fur protruding from the nutria skin. These coarse hairs must be plucked before the nutria pelt is matched, and the plucked hairs, chopped into minute particles make the finest of felt.

Because the nutria fur has only just begun to reach the market in any quantity, heretofore the fur has been used mostly for the trimming of coats, hats and suits, but now the actual manufacture of all-nutria coats for Milady has begun. One furrier in New Orleans recently completed the first nutria coat, which he valued at $1,800. The fur is a blueish chocolate in color and as soft as moleskin. In addition it is extremely light in weight, which will make it all the more popular with the fur wearers, although furriers claim the nutria coat will be as durable as mink.

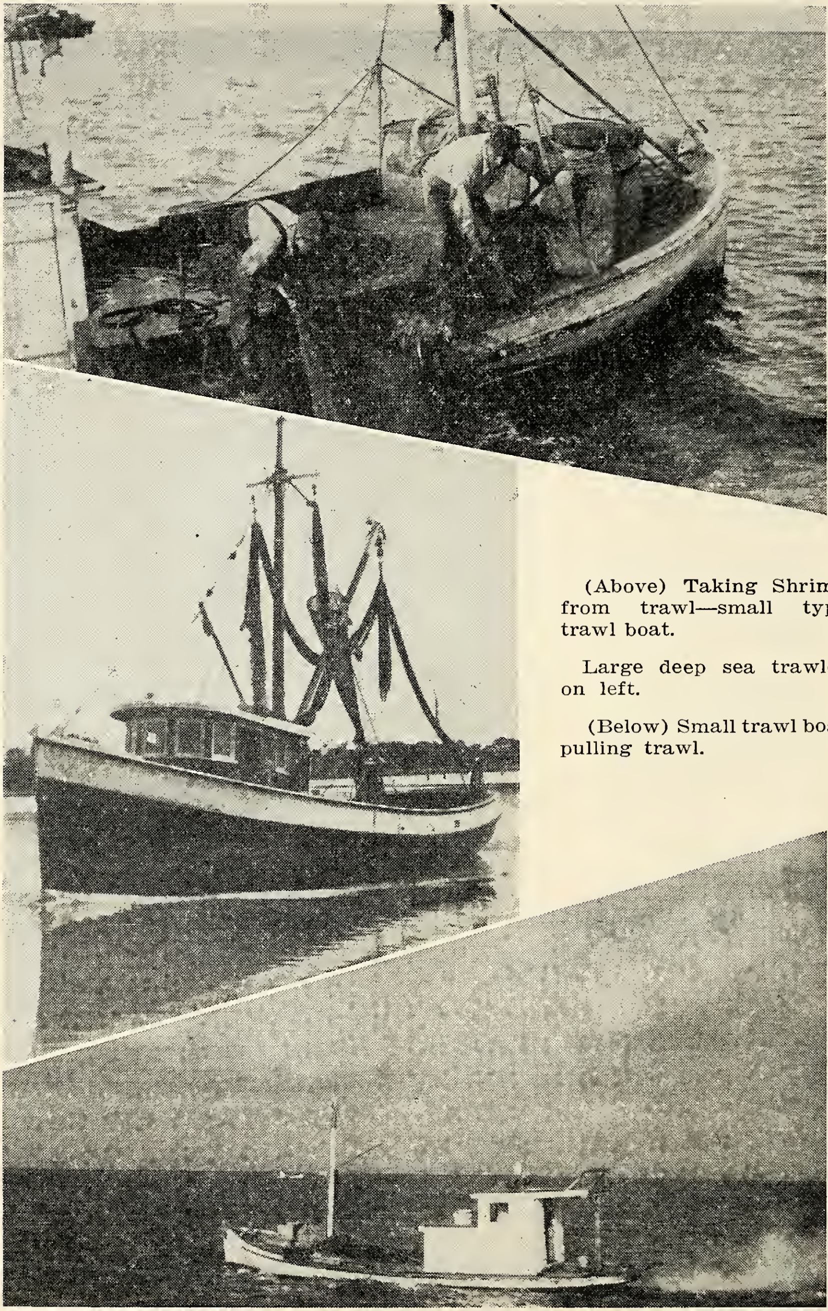
The habits and characteristics of the nutria are not the least similar to the muskrat or the beaver. It has a body not unlike the muskrat, and the long rat-like tail instead of the flat tail of the beaver. It needs water for its daily habits as a beaver does, yet it does not build dams or clog streams. Instead it builds a "house" much in the same way the muskrat does.

The mouth of the nutria is set far back of the snout, so far in fact it cannot be seen unless the head is tilted upward. Because of this the nutria is unable to drink without submerging its head, or at least part of its head in water. It has four of the strongest, orange-colored teeth of any animal its size, and these can be used disastrously on anything that incurs the anger of the animal. It's two hind feet are webbed like those of a duck, and its forepaws are similar to those of a raccoon, and as dextrous as the hands of a monkey. They are easily domesticated and make most enjoyable pets.

A female nutria produces three litters of young in two years and the number of each litter ranges from six to ten, thus it may be seen that their rapid reproduction is not strange. But one of the strangest things about the nutria mother is her anatomical construction. Instead of teats on her belly, she has them alongside her backbone, doubtless to permit the young to nurse as she swims.

During the 1947-48 trapping season in Louisiana 28,176 nutria were trapped and the pelts sold for a total of $84,528. All this from the dozen that escaped from captivity on Avery Island 10 years before. Thus it is not hard to understand that in another 10 years the value of the nutria crop in this state alone will exceed that of the muskrat, although the 1947-48 muskrat crop was valued at more than eight and a half million dollars.

Quite a sizeable fortune that has come to Louisiana by accident, isn't it?



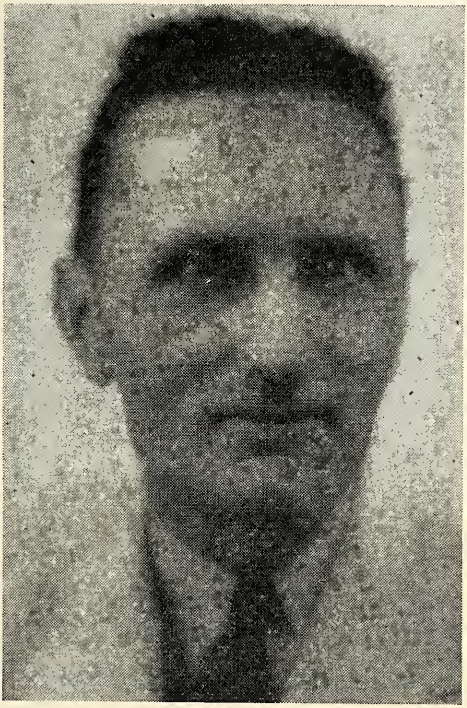
(Above) Taking Shrimp from trawl—small type trawl boat.

Large deep sea trawler on left.

(Below) Small trawl boat pulling trawl.

FRESH AND SALT WATER FISHERIES

W. S. Werlla, *Supervisor of Revenues*



William Werlla

THIS resume covers the activities and conditions in the commercial salt and fresh water fish and shrimp industry for fiscal years 1947-48 and 1948-49, also, in some instances for the calendar year 1948-49. We also are showing records of production and other information for many prior years, purely as a basis for comparison.

Under the supervision of the Department of Wild Life and Fisheries are administered all particulars concerning the welfare, development and exploration of the Fishing and Shrimping industry of this State.

The Conservation Commission was created by Act 144 of the 1908 session of the Louisiana Legislature and one of the principles of government was:

> "He who severs, and profits by exhaustion of, the Natural resources of the State, in creation of which he had no hand, should in addition to the common burden of the expense of government borne by all alike, bear an additional burden of taxation, the proceeds to go towards replacing either the resource which he has re-

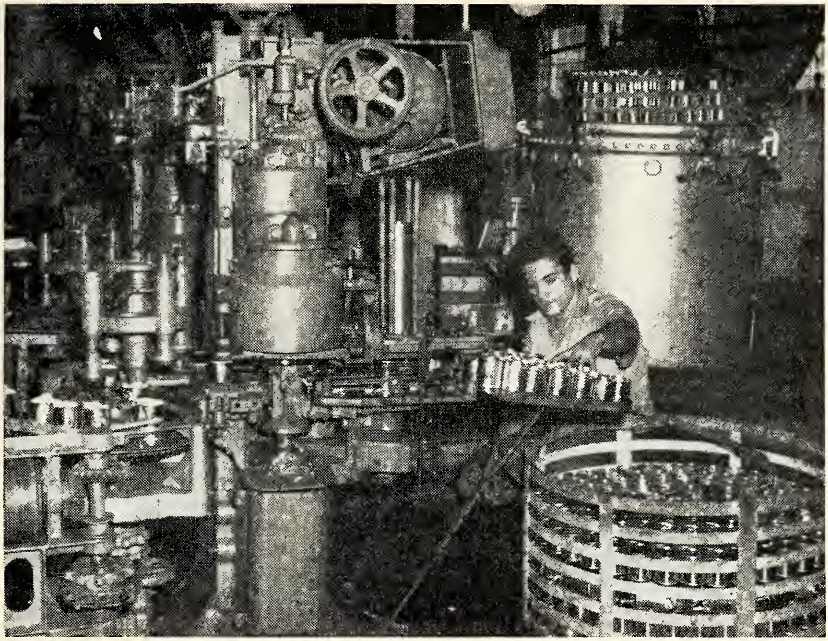
> moved, or if that be impossible, toward renewing one which by its nature is renewable."
>
> This Commission of 1908 further stated:
>
> "Among those who do not conserve or reproduce from want of information or warning, education must be stressed.
>
> In the case of those who look alone to their own profits, totally regardless of the public welfare, the law must enter in behalf of the public, and regulate the operation of this class.
>
> The operator in natural resources, who operates solely for his own profit and without regard to the effect of his operation on the public welfare proceeds on the theory that what he has bought and paid for, he may do with as he pleases. He is wrong.
>
> It is the principle of law necessarily adopted by men when they associate themselves together in government, that the rights of any individual must necessarily be limited by the rights of his fellow individual. To say that a man may do what he pleases with his own is denied in a thousand ways, not only by law, but by custom and even public opinion."

The principles of government are the same today, and as will be shown by following statistics, this state has made enormous gains in this industry. However, modern methods of processing, handling and the ever increasing demand is raising the value of the products two thousand per cent, increase (600%) in the number of fishermen, over a period of years, and has placed an ever increasing pressure on the available crop, and demands that we now make a close study of our laws, methods of conservation, and revenue, if we are to increase our production or at least hold what we now have.

REVENUES DERIVED FROM COMMERCIAL FISHING AND SHRIMPING

Table 1
Wholesale and Retail Fish and Shrimp

	1947-48	1948-49
Wholesale Fish and Shrimp Dealers	$ 18,050.00	$ 21,700.00
Wholesale Fish and Shrimp Dealers Agent	1,090.00	1,380.00
Retail Fish and Seafood Dealers	7,200.00	11,780.00
Total	$ 26,340.00	$ 34,860.00



Canning Machine sealing 5 oz. cans of shrimp.

Table 1-A

Fresh Water Fisheries

	1947-48	1948-49
Commercial Fishermen (Bait Sellers, Trot Lines, etc.)	$ 3,920.00	$ 3,810.00
Hoop Nets	7,285.00	8,835.00
Seines	4,960.00	3,555.00
Trammel Nets	4,055.00	4,085.00
Gill Nets	5,185.00	7,195.00
Total	$ 25,405.00	$ 27,480.00

Table 1-B

Salt Water Commercial Fish

	1947-48	1948-49
Fish Seines	$ 970.00	$ 1,055.00
Fish Trammel Nets	1,420.00	1,800.00
Total	$ 2,390.00	$ 2,855.00

Table 1-C

Shrimp Fisheries

	1947-48	1948-49
Trawl and Vessel Licenses	$ 51,290.00	$ 45,245.00
Shrimp Seines	40.00	20.00
Freight Boats	3,440.00	2,840.00
Non-Resident Shrimp Fishermen	5,600.00	1,000.00
Severance Tax	75,472.25	66,979.27
Total	$135,842.25	$116,084.27

Table 1-D

Total Revenue Salt and Fresh Water Fisheries	$189,977.25	$181,279.27

SHRIMP PRODUCTION AND NUMBER OF TRAWLS AND/OR SEINES

Table 2

Calendar Year	No. Barrels Shrimp (210#)	No. of Seines	No. of Trawls Fiscal Year	No. of Trawls Calendar Year
1908	40,857			
1913	50,000	131		
1914	52,381	250		
1915	57,143	268		
1916	85,714			
1917	57,143	?		4
1918	71,429	300		17
1919	76,190			
1920	152,381	97		499
1921	163,012	135		983
1922	109,050	111		699
1923	153,759	128		1,021
1924	150,624	143		905
1925	154,722	180		1,010
1926	123,967	143		692
1927	150,896	120		913
1928	195,303	261		1,454
1929	210,033	124		1,486
1930	197,550	172		1,176
1931	178,815	126		1,131
1932	152,373	66		699
1933	166,058	67		1,045
1934	226,576	107		1,441
1935	252,981	125		1,433
1936	286,749	30		1,920
1937	362,942	35		2,313
1938	363,656	13		1,662
1939	395,050	26		1,621
1940	397,189	5		
1941	554,354	5	3,028	
1942	489,173	4	2,380	
1943	441,445	4	2,101	
1944	544,378	4	1,866	
1945	495,994	4	2,373	
1946	464,981	4		3,030
1947	365,617	4		3,200
1948	376,605	4		3,408
1949	376,040	4		3,310

Louisiana has approximately nine-hundred and fifty miles of coast line, taking into consideration the bays and bayous.

The first successful commercial canning of shrimp took place in 1867, when the Dunbars built their floating cannery and opened for business by Grand Terre Island, Louisiana. The first record of production was in 1908 when the Conservation Commission was formed. At that time shrimp were used for drying and canning only, with the exception of a small amount for local consumption. Shrimp at that time were caught in seines and cast nets and in those years fresh shrimp were not exported, for example the old French Market would receive the supply, brought in by wagons, by allowing their fishermen to deliver from three to five barrels each, depending upon the demand, with their fish catch. Medium sized shrimp could then be caught in sufficient quantities with a small 75 to 100 foot seine and the French Market would sell them at one penny each to such places as the St. Charles Hotel, Fabacher's Restaurant and others.

As shown in Table No. 2 shrimp seines from 100 feet to 3,000 feet were used exclusively until 1917 when trawls first came into use. From 1917 to this date the use of seines has been abondoned. Today we have four small 500 foot seines in use, however where we show 300 seines in use for 1918, today we have 3,310 trawls being used.

It was not until 1934 that the deheading of shrimp was started, creating a new fresh shrimp market for export out of the state. It was found that by taking the heads off the shrimp and icing them, they could not only be shipped with less chance of spoilage, but that as the head consists of 40% of the shrimp, the express rates would be reduced by that amount.

In the year 1937 new shrimping grounds were discovered, twenty miles off shore located from Trinity to Ship Shoals in ten fathoms of water. Prior to this time the smaller type shrimp luggers, 25 to 40 feet long, were adequate but now to fish these off-shore waters successfully, the larger boats were necessary. The use of the larger boats and new waters not only increased the number of boats in use but increased the production until in 1940-41 we doubled the number of boats and production of shrimp.

Within the past 15 years due to new methods of processing, quick freezing, packaging and methods of quick transportation, fresh shrimp are now universally accepted and the demand often exceeded the supply, increasing the value per barrel from $3.00 in 1908 to as high as $110 at the present time.

Where until 1934 we only marketed canned and dried shrimp today we market:

Fresh whole shrimp

Fresh headless shrimp in 100 lb. boxes, one to five pound packages.

Fresh raw peeled shrimp (small quantity)

Cooked and peeled shrimp—four, eight ounce—one to five pound packages or can.

Canned shrimp

Dried shrimp

Shrimp meal—for fertilizer and poultry food concentrate

The Conservation laws, policies and methods of collecting revenues from the Louisiana Shrimp Industry are virtually the same as when they were first established in 1908. When these conservation rules were put into effect, the Louisiana Shrimp Industry was rated at approximately $200,000 a year. Today the shrimp industry is valued at approximately $20,000,000 annually and the same governing rules, established for the infant industry in 1908, are still being depended upon to govern the present fabulous production of seafoods.

One of the greatest problems confronting the Department of Wild Life and Fisheries today is in the conservation and perpetuation of the State's Shrimp Industry.

Shrimp fishermen should realize that the laws governing open and closed seasons on shrimp fishing, are for their own benefit, as well as the conservation of this state's shrimp supply. Shrimpers will fish diligently for unmarketable small shrimp in the hope of capturing a barrel or two that they can't hope to sell for more than $8 to $10 per barrel, and in the process destroy millions of exceedingly small shrimp. If they could be made to realize that within sixty days these small shrimp would grow in size to choice commercial shrimp worth $60 per barrel or more, and that the one barrel of small shrimp they captured would, within sixty days, have grown to approximately seven barrels, they might be made to see that these regulations are enforced solely for the shrimp fishermen's benefit, although they have been established as a protection for young growing shrimp.

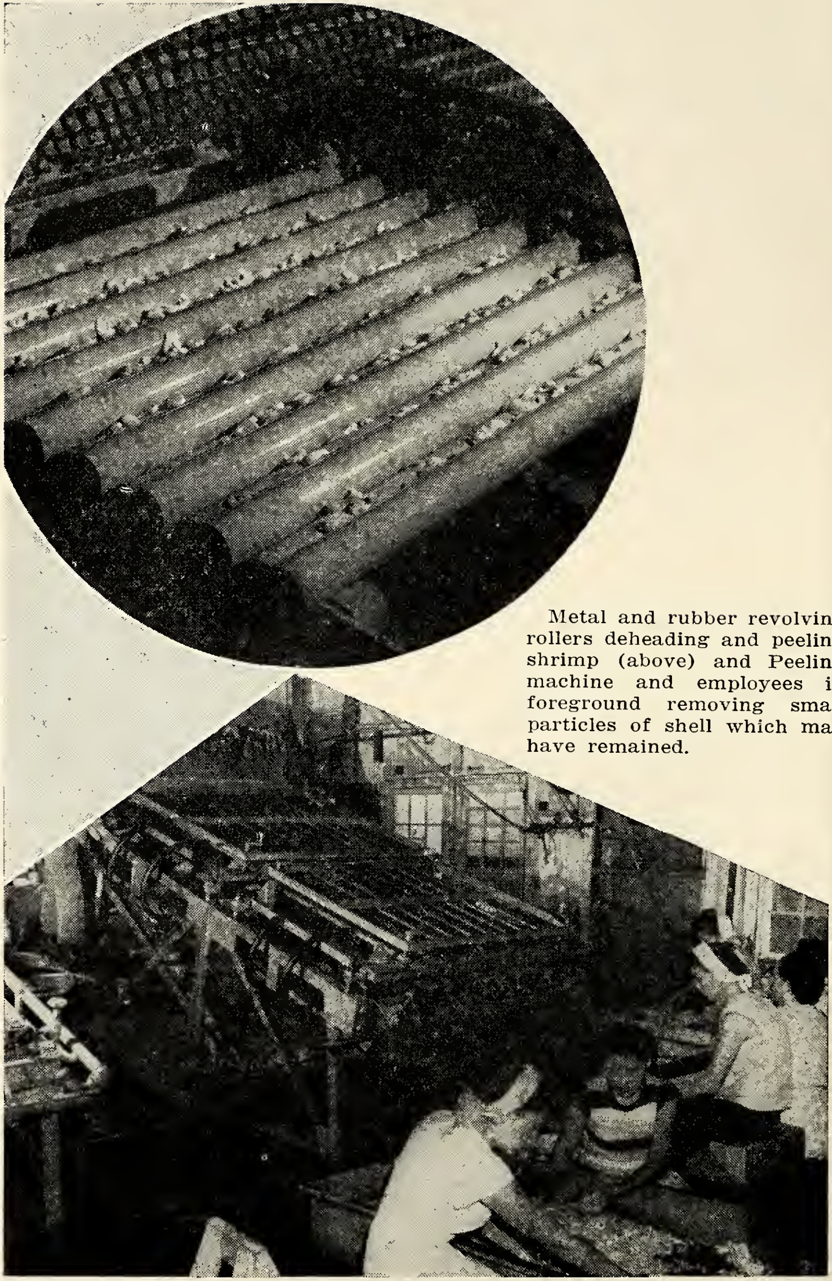
If we admit that the present take of shrimp in Louisiana is the maximum amount, unless we develop new shrimping grounds, which is sound reasoning, because the shrimp hatch is not affected by weather conditions, fires, etc., as other resources, we could still increase our production and values of the catch, on certain types of shrimp, if a proper season was set, so as not to take or destroy our small shrimp, allowing them to increase seven times in size and weight and thirty-seven times in value.

There are over 8,500 shrimp fishermen. We have 254 wholesale dealers and processors.

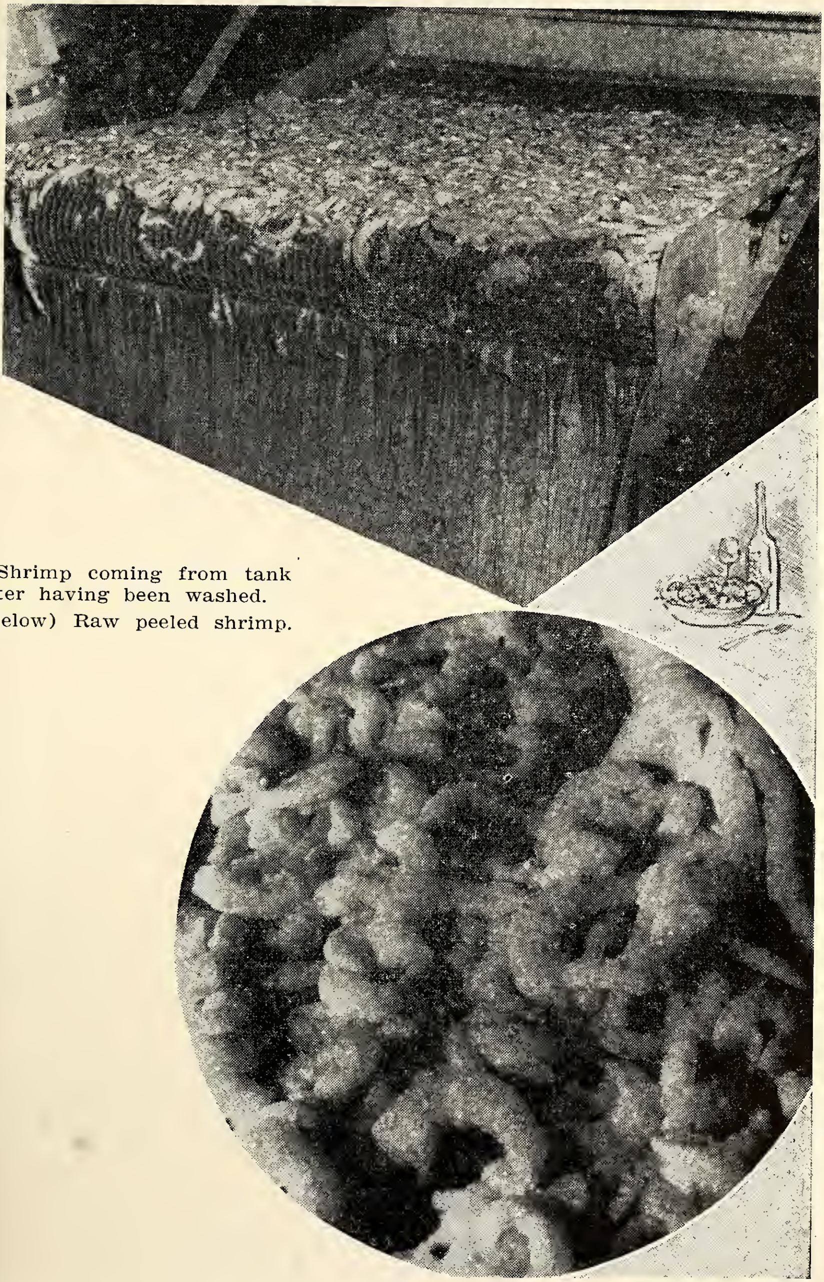
Boundaries Important

One of the most important if not *the* most important matter to be decided upon for the conservation and increased production of our shrimping industry is the setting up of the proper closed season on shrimp and the defining of the inside and outside waters of our coast. We have several conflicting areas on our 950 mile coast line where the operators have never been able to decide or agree as to when the proper closed season should be in order, to derive the most benefit for the state as a whole. Some persons will conscientiously hold out for a closed season in their area because that area is most suitable for their type of operation at a certain period. Others will not agree because their type of operation and processing is different.

Louisiana is different from other states because it has so many different types of operations, so many small and large boats that operate differently. It is difficult to agree on a closed season for those reasons. We cannot afford to pass legislation to favor one interest and bankrupt others—but a season must be set that will benefit the state as a whole and not discriminate against any one operation. There has always been a difference of opinion, among Louisiana people, as to the spawning, movements, growth and classification of our Gulf shrimp. However,



Metal and rubber revolving rollers deheading and peeling shrimp (above) and Peeling machine and employees in foreground removing small particles of shell which may have remained.



Shrimp coming from tank after having been washed. (Below) Raw peeled shrimp.

our state and federal biologists through research and study over a period of many years agree upon certain facts. These biologists are not only nationally but internationally known, their opinions and findings are accepted and respected. From the findings and opinions of these gentlemen we should arrive at some understanding as to the seasons for these areas.

SIZE AND NUMBER OF SHRIMP TRAWLS REGISTERED FROM EACH PARISH, YEAR 1948

Table 3

		Number of feet in length					
	Total	17 to 30	31 to 40	41 to 50	51 to 60	61 to 80	Over 80
Jefferson Parish	358	140	164	44	8	1	1
St. Charles Parish....	55	22	29	4	..	..	..
Plaquemines Parish ..	356	83	200	60	12	1	..
St. Mary Parish.......	282	14	78	76	93	18	3
Calcasieu Parish	30	9	12	7	1	1	..
Cameron Parish	48	6	27	8	4	3	..
Vermilion Parish	23	4	6	9	4	..	..
Iberia Parish	78	28	24	13	12	1	..
Lafourche Parish	455	51	227	139	35	3	..
St. Tammany Parish..	69	6	17	31	14	1	..
St. Bernard Parish...	290	78	162	38	11	1	..
Orleans Parish	48	18	13	8	9	..	..
Lafayette Parish	2	..	..	2	..	..	..
Jefferson Davis Parish	1	..	1	..	..	..	..
Terrebonne Parish ...	745	..	461	110	11	1	..
	2,840	621	1,421	549	214	31	4
		Under 40 ft.		Over 40 ft.			
Mississippi Boats	568	302		266			
	3,408						

From the above Table No. 3 it is shown that in this state there were 2,344 boats under 40 feet, and 1,064 over 40 feet in length operating.

With exceptions the 2,344 boats operate in the inside waters pulling a trawl from 20 to 50 feet in length, the 1,064 larger boats can operate outside waters pulling a trawl up to over 100 feet in length.

There are about 8,500 men operating these boats, each averaging three dependents, making an approximate total of 34,000 persons almost totally dependent upon this industry for their livlihood.

The valuation of the 3,400 boats is from two to seventy-five thousand dollars per boat, a conservative estimate of the total investment in boats alone, not taking into consideration fishing equipment, would be thirty million dollars.

SHRIMP PRODUCTION LANDED IN EACH PARISH FOR THE YEAR 1948

Table No. 4

Parish	No. Barrels (210#)
Orleans, Plaquemine and St. Bernard*	54,412
Jefferson	58,876
St. Tammany	3,692
Lafourche	69,531
Terrebonne	83,442
St. Mary	57,133
Iberia	4.030
Cameron	6,160
Mississippi	**39,329
Total Production	376,605

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* These parishes combined because shrimp mostly trucked to New Orleans area for processing and whole fresh sale.

** These shrimp caught in Louisiana waters by Mississippi boats (Louisiana having a reciprocal agreement with Mississippi) and taken to Mississippi plants for processing.

The production for Jefferson, Lafourche and Terrebonne parishes include the small shrimp used for drying purposes, 49,189 barrels for the year 1948.

MONTHLY AVERAGE SHRIMP PRODUCTION SIX YEARS 1941-46 AND THREE YEARS 1947-49

Table 5

Month	6 year monthly barrel average 1941-46	Per Cent	3 year monthly barrel average 1947-49	Per Cent
January	52,312	10%	17,029	4½%
February	34,691	7%	10,815	3 %
March	19,001	4%	11,823	3 %
April	12,591	3%	20,506	5½%
May	21,985	4%	36,730	10 %
June	37,996	8%	22,818	6 %
July	29,907	6%	5,680	1½%
August	19,603	4%	47,050	12½%
September	60,210	12%	49,114	13 %
October	66,999	13%	69,616	19 %
November	74,775	15%	48,244	13 %
December	68,312	14%	33,329	9 %
Total	498,382	100%	372,754	100 %

The above record shows a 26.2 per cent decrease during the past three calendar years. By referring to Table No. 2 it will be noted that we have had more boats operating in this state the past three years than at any previous time, and they should have at least caught an equal amount. The shrimp catch may vary to some extent, comparing one year with another, due to adverse weather conditions not allowing boats to shrimp in certain periods; but comparing the catch for a period of years should equalize these conditions, therefore the decrease shown should be established and this lengthy report showing prior records is being primarily made to call attention to the seriousness of the situation for correction if possible.

BARRELS OF VARIOUS TYPES OF PROCESSED SHRIMP MARKETED DURING THE PAST FOUR YEARS AND VALUE TO THE PRODUCER

Table No 6

BARRELS (210 lbs.)

Type of Processing	1946	1947	1948	1949	Average per year	Per Cent	
*Whole and Canned	207,296.8	148,915.9	135,815.7	139,870.5	157,975.0	40%	$ 5,700,000.00
Headless	199,591.0	180,262.3	169,881.6	147,431.7	174,292.0	44%	11,800,000.00
Dried	47,879.3	23,787.0	49,189.4	52,618.2	43,368.0	11%	600,000.00
Cooked and Peeled	10,213.8	12,652.2	21,718.6	36,119.3	20,175.0	5%	1,200,000.00
Total	464,980.9	365,617.4	376,605.3	376,039.7	395,810.0	100%	$ 19,300,000.00
Tons of Shrimp Meal	670.3	333.0	688.7	736.6	607.2		45,000.00
							$ 19,345,000.00

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* The whole and canned shrimp are combined, due to the fact that many reports from dealers show receiving whole shrimp, which are only sold for local consumption. If an oversupply is purchased the balance is transferred to factories for canning. The demand for whole shrimp is approximately ten thousand barrels per year.

Over ninety-five per cent of shrimp are exported out of this state. The cost of delivery, handling, processing and profits of dealers increases the price of the finished product to the next wholesale and retail dealer who add their cost and profits before it is sold to the actual consumer.

Louisiana in 1949 had 162 shrimp processing plants. Thirty-six were located in Mississippi, but the majority of these were Louisiana corporations. Twenty-six were drying platforms. In addition to the 162 processing plants, Louisiana had 92 wholesale dealers, who did not process, but purchased the processed product for export. These processing plants, huge refrigerated trucks and other equipment, are valued at millions of dollars; the employees and dependents for the plants, etc., are many thousands in number.

No attempt is being made in this report to outline the progress in the processing of each type of the finished product. In the earlier years, where it would take weeks to prepare shrimp for delivery and consumption, today it is a matter of hours. For example the latest development for processing raw shrimp for canning and cooked and peeled, is a machine developed by one of our oldest processors, Mr. E. M. Lapeyre, of Houma, Louisiana.

A brief description of the operation of the recently developed shrimp peeler is as follows:

The raw shrimp are conveyed to a tank which serves as hopper and washer. The shrimp are gently agitated in this tank and fed to a conveyor belt feeding the actual peeling machine.

The peeling machine discharges its duty by means of a combination of revolving rollers (both metal and rubber) and also through the aid of mechanical fingers which place a gentle but firm pressure on the shrimp. This pressure breaks up the adhesion between the meat and the shell, at the same time holding the shrimp against the revolving rollers. The reduction in adhesion, between meat and shell, allows the rollers to remove the shell by gripping small protruding particles of the shell.

As the peeling surface of the machine (the rollers) are set at a slight angle to the horizontal (15°) the shrimp are automatically carried down the rollers to their ends where the meat is taken and distributed mechanically to desired points.

The use of one machine is claimed to eliminate the need for from 15 to 60 pickers, who previously performed this work manually, also to increase the yield of meat from five to ten per cent.

Production of Shrimp By Gulf States

While this state still produces 47 per cent more shrimp than the four other Gulf States combined, Mexico (who has only within the last few years developed its industry) due to more favorable working conditions, is exporting its catch to this country, at a cheaper price, in competition with our production, and has worked considerable hardship on our dealers.

Louisiana has for many years produced up to seventy per cent of the shrimp in North America. Within the past few years, due to the demand and increased price, some of the other Gulf

States have increased their production considerably. The latest production figures available are:

State	Period	Number Barrels Production (210#)
Florida	1948	80,257
Texas	Sept. 1, 1948 to Sept. 1, 1949	100,405
Alabama ...	1949	6,839
Mississippi .	1949	12,868
TOTAL		200,369
Mexico (exported into United States) ..	1949	119,048 (estimated for Dec. 1949)
		319,417
Louisiana ..	1949	376,040

There has been some discussion about remedying this condition by having the United States Government place an embargo or import tax on Mexico exports. Nothing has materialized from these discussions. The Phillipine Islands, who were one of the largest purchasers of dry shrimp, now have an embargo on our exports to their country. Our exports being limited to 20 per cent of 1948 sales to them.

Drying shrimp was the first method of processing shrimp. At the present time we have 26 drying platforms in this state. We have had as many as 42. Louisiana is the only state that markets dry shrimp to any extent, Mexico has experimented, but not successfully. India and Indo China dry a few. All of our platforms are located in Jefferson, Lafourche, Terrebonne and Vermilion parishes, the majority in the marshes. The method of drying is to take the raw shrimp, delivered direct to the platforms by boats, late in the afternoon, and there the platforms cook them in the evening, and at night.

These shrimp cannot be iced because the finished product would turn black. The fresh shrimp are washed, then placed in boilers of water, to which salt has been added, and cooked from 12 to 20 minutes, depending upon the size of shrimp. The next day, if the sun is out, these cooked shrimp are spread out on the platform, and are turned over six or eight times daily. At night, or in wet weather, they are raked into a pile and covered by large tarpaulins. Again the next day they are spread out on platforms, and by noon, if the sun has been hot enough, they are dry.

They are then placed in beaters, made of heavy mesh wire, which are turned at a moderate rate of speed, and this separates the dry meat from heads and chaff, which is used for processing into shrimp meal.

The dried meat is then sacked for marketing. Louisiana has dried as many as 80,000 barrels per year, and now averages around 50,000.

For drying purposes only small shrimp can be successfully used, as the large shrimp would be too difficult to dry, and also, due to the demand for fresh shrimp, would be too expensive. Over ninety-five percent of dried shrimp are exported to the Hawaiian Islands, Phillipines, West Indies, Cuba, Central and South America. The small United States consumption, is principally purchased by Chinese population, in half to one ounce cellophane bags, for seasoning.

Louisiana has three species of shrimp commonly known as White, Brazilian and Sea Bobs. The White and Brazilian will grow to a large size, however the "Sea Bob" usually runs from 80 to 120 to the pound, no larger, and it is this species that the platforms mainly use. It is claimed that 80 per cent of the shrimp used for drying purposes, are "Sea Bobs".

The yield of dry shrimp and meal from a barrel of (210#) fresh shrimp is approximately

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White shrimp	26 to 28# Meat	30# Meal
Brazilian shrimp....	30# Meat	30# Meal
Sea Bobs	24# Meat	37 to 38# Meal

The dried shrimp meat sells from 50¢ to $1.25 per pound. The meal now is approximately $75.00 a ton.

The shrimp meal, during the war, was almost exclusively purchased by the U. S. Government for Turkey food concentrate. It is now being used as fertilizer for the tobacco farms, and in Louisiana for potatoes, for poultry food concentrates, and also for shrimp bait, the meal being scattered over inland bays and bayous, in order to concentrate shrimp in certain areas for larger catches.

PRODUCTION OF DRIED SHRIMP FOR CALENDAR YEARS 1948-49

	1948	Per Cent	1949	Per Cent	Yearly Average	Per Cent
January	903 bbls.	2 %	4,727.6 bbls.	9 %	2,815.3 bbls.	5½%
February	326.5	.7%	699.4	1 %	512.5	1½%
March	153.3	.3%	611.1	1 %	382.2	1 %
April	550.8	1 %	247.1	.4%	398.9	1 %
May	10,796.5	22 %	1,489.7	3 %	6,143.1	12 %
June	4,086.6	8 %	3,152.7	6 %	3,619.6	7 %
July	444.5	1 %	360.6	.6%	402.5	1 %
August	452.5	1 %	4,978.0	9 %	2,665.2	5 %
September	3,804.7	8 %	5,357.2	10 %	4,580.9	9 %
October	10,967.6	22 %	8,727.2	17 %	9,847.4	19 %
November	6,896.4	14 %	15,262.9	29 %	11,079.6	21½%
December	9,807.7	20 %	7,104.7	14 %	8,456.2	16½%
TOTAL	49,139.4 bbls.	100 %	52,618.2 bbls.	100 %	50,903.4 bbls.	100 %
Shrimp Meal	688.651 Tons		736.654 Tons			

FISH PRODUCTION—CALENDAR YEAR 1947
FISCAL YEAR JULY 1948 THROUGH JUNE 1949

Fresh Water Fisheries:

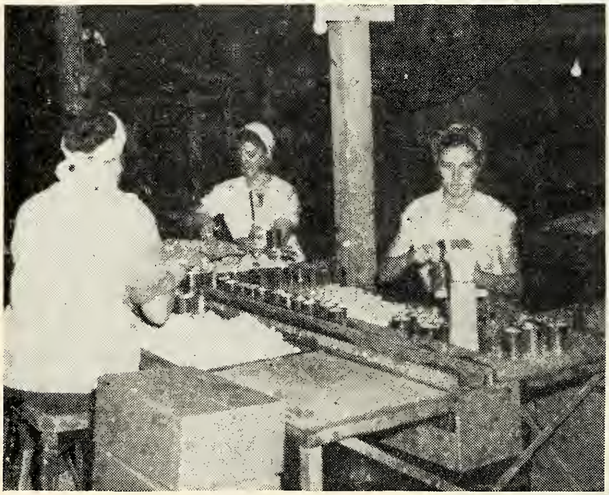
Type of Fish	1947 Production	Valuation	Fiscal Year 1948-49 Production	Valuation
Catfish	4,753,944 lbs.	$ 950,788.80	6,924,320 lbs.	$ 1,384,864.00
Gaspergou	1,533,109	306,621.80	2,203,453	440,690.60
Spoonbill Cat	93,655	20,604.10	327,878	72,133.16
Buffalo	3,146,606	471,990.90	5,117.631	767,644.65
Garfish	229,204	22,920.40	861,191	86,119.10
Common Commercial Fish	431,248	43,124.80	590,572	59,057.20
River Shrimp	48,462	36,346.50	121,519	91,139.25
Fresh Water Turtles	125,921	18,888.15	135,660	34,165.00
Frogs	269,297	126,569.59	199,232	93,639.04
Crayfish	380,863	114,258.90	1,104,210	331,263.00
TOTAL	11,012,309 lbs.	$ 2,111,113.94	17,586,666 lbs.	$ 3,360,715.00
Diamond-back Terrapins	329 doz.	9,870.00	1,599 doz.	47,970.00
		?		?
Baby green turtles	312,067 doz.	312,067.00	446,416 doz.	446,416.00
TOTAL	312,396 doz.	$ 321,396.00	448,015 doz.	$ 494,386.00

Salt Water Fisheries:

Type of Fish	1947 Production	Valuation	Fiscal Year 1948-49 Production	Valuation
Speckled Trout	411,480 lbs.	$ 102,870.00	508,569 lbs.	$ 127,142.25
Redfish	382,240	114,672.00	565,140	169,542.00
Sheepshead	118,097	23,619.40	145,439	29,087.80
Flounders	97,951	19,590.20	204,504	40,900.80
Red Snapper	283,458	127,556.10	163,327	73,497.15
Common Salt Water Fish	912,576	182,515.20	1,382,428	276,485.60
Sea Turtles	44,889	17,955.60	4,348	1,739.20
Crabmeat	1,005,441	904,496.90	556,114	500,502.60
Hard Shell Crabs	10,154,211	338,473.50	9,956,958	331,897.50
TOTAL	13,410,343 lbs.	$ 1,831,748.90	13,486,827 lbs.	$ 1,550,794.90
Soft Shell Crabs	65,462 doz.	$ 130,924.00	17,026 doz.	$ 34,052.00

The commercial fish production of Louisiana ranks among the highest in the United States. The total amount of revenue collected by the Department of Wild Life and Fisheries from the producer, as shown in Tables 1-A, and 1-B, was $30,335.00 for the fiscal year 1948-49, and the estimated value of the catch to the producer was $5,500,000.00, or about one-half of one mill

Taking heads off shrimp manually (on Right) and below. Cooked and peeled shrimp being weighed and packed in 5 oz. cans.



Headless shrimp in 100 pound boxes for icing and shipping.

of the valuation. There were the following number of licenses sold:

Fresh Water Licenses	Number	Salt Water Licenses	Number
Trot Lines, bait sellers, etc.	762	Seines	70
Hoop Nets (set of 15, one license)	1,765	Trammell Nets	120
Seines	235		
Trammell Nets	277		
Gill Nets	480		
TOTAL	3,519	TOTAL	190

Except for the sale of licenses there are no other taxes or revenue collected from the fishermen. The more than 31,000,000 pounds is not the actual production, because this does not take into consideration the tons that are sold by smaller retailers, fishermen direct to the consumer, and the fact that it is difficult to get reports from the dealers. The figures also do not include the tons caught by anglers, and as Louisiana requires no anglers' license from its people, unless they use a rod and reel, or artificial bait, the take by other thousands of fishermen.

Naturally it includes no game fish which may not be sold. Fish in this state is the most common food known, and any man, woman or child can, with a little effort, procure whatever amount is required of some type of salt and fresh water fish, or other seafood, the entire year. Louisianians have always enjoyed this privilege and for this reason they never have, and do not at this time realize, what an invaluable resource they possess.

Processing and marketing of commercial fish, and the development thereof on a basis with other states is not comparable.

We market and export ours in the rough, and our chain stores, and other retail, wholesale, and quick freeze plants sell, almost without exception, beautiful individual packages of whole and fillet fish, that are imported into this state, and do not equal in quality, our own. Our restaurants and hotels feature these out of state fish on their menus. Louisiana should have unlimited possibilities in this field.

The oldest method of curing fish for export has been used by our Chinese drying platforms for over 70 years. Today there are approximately 10,000 pounds dried annually by four of these concerns. Speckled and white trout are principally used. These fish are caught with pole and line, they are not cut open, the

Shrimp spread on drying platform for sun drying after having been cooked.

gills being removed and in so doing withdrawing the entrals, the fish are then washed and put in large brine barrels with salt, where they remain from one to three days, depending upon the size of the fish. They are then placed upon the drying platform on long tables, allowed to remain in the sun from one to three days, depending upon the weather, and then dry-packed in barrels for shipment. They are consumed mostly by the Chinese population of the United States. The decrease in the amount dried today is due to competitive prices paid for fresh fish.

Frog Industry

Louisiana has produced and exported as much as 2,000,000 pounds of frogs. In 1948-49 our records show only about 200,000 pounds handled. There has been a considerable decrease in our frog production within the past ten years, however the 200,000 pounds shown is not an accurate record of production, as dealers have failed to report all shipments for that period.

The entire catch of frogs is almost exclusively shipped outside of this state, because the supply has never met the demand, and prices paid by Northern and Eastern markets are very high, frog legs being considered a delicacy, in those markets.

Turtles Scarce

Our supply of diamond-back terrapins is dwindling each year. At one time we exported ten times as many as we do now.

One of this state's growing industries is the shipment of baby green turtles. There have been over 5,350,000 of these turtles shipped alive out of this state. These turtles, at mature growth, measure about seven inches, live on plant life, are very rarely used as food, and are purchased as novelties and for ornamental purposes in aquaria. These small turtles, their backs painted different colors, can be purchased in pet shops and other places in this state, selling for as much as sixty-five cents each.

Crab Pack Huge

Louisiana crab processing plants normally pack over two million pounds of crab meat annually, a very small portion being consumed locally. This is not considering the hard crabs, which are boiled and consumed principally by Louisianians. We market over 600,000 soft shell crabs annually.

Fish on drying tables after coming from Brine Barrels.

There were 172 wholesale fish dealers in Louisiana during 1949, who process and handle the fish caught by our fishermen, their cost of operation and profits is not estimated in our report.

The conversion of Menhaden fish, taken from Gulf Waters, to oil and fish scrap, by five Menhaden plants located on Louisiana and Mississippi shores, has developed within recent years to one of our larger industries. The annual take of these small fish is approximately 250,000,000 pounds—the revenue to the department $620.00 for netting—no other taxes or licenses have been assessed.

ESTIMATE OF VALUE OF PRODUCT TO PRODUCER, NUMBER OF EMPLOYEES AND DEPENDENT'S AND ESTIMATE VALUE OF PLANTS, EQUIPMENT, ETC. IN FISHERIES

Our fisheries, considering our 950 miles of coast line extending out into the Gulf, our fresh water lakes, bayous and streams constitutes the largest area of the state or possibly of any state in the Union. The investment, value, employees and produces are:

Estimated value to producer	$28,000,000.00
Estimated number of producer and their dependent's wholely or in part dependent for livelihood	$60,000.00
Estimated investment in vessels and equipment	$30,000,000.00
Estimated investment in netting, trucks, skiffs, etc.	$5,000,000.00
Estimated investment in shops, plants, equipment, trucks, etc.	$40,000,000.00

There are approximately 60,000 persons in this state engaged in, or dependent upon, Louisiana's Fisheries Industry. This industry produces approximately $28,000,000.00 annually, with an estimated investment of more than $75,000,000.00. Despite the extremely rich returns on this Fisheries Industry from this $28,000,000.00 each year, only four tenths of one mill of the assessed valuation of this industry is returned to the State of Louisiana in taxes and licenses. With this meager amount the Department of Wild Life and Fisheries is charged with the enforcement, conservation, restoration and perpetuation of the entire Fisheries Industry.

Those who realize the profit on all fisheries products, above the valuation assessed on the producer, pay nothing in taxes to the Department to aid in the conservation work so necessary to the progress and future of Louisiana's fisheries resources, the entire tax being based on the $28,000,000.00 valuation, and not on the resale of various fisheries products after they have been processed and distributed.

The statement has been made, and disproved that, "You cannot deplete the sea."

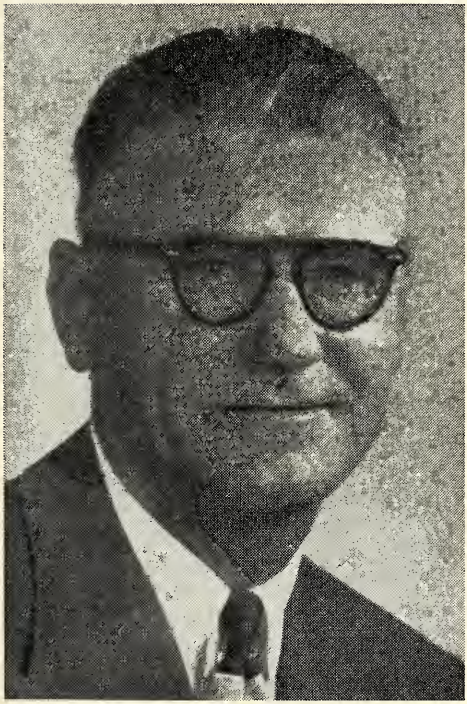
Possibly this is true in the largest sense. It doubtless is impossible to take from the sea all of its forms of life, but it has been proven, time and again, that certain forms of fish and other marine life have been depleted from the waters by unwise methods of taking and by violating rules of practical conservation.

Fishing with hook and line, whether on the old fashioned cane pole or by the use of modern rod, reel and line, with natural or artificial baits and lures, presents no problem that might lead to the extinction of any species of sea fish. Few problems, too, are presented even by commercial fishing carried on under proper regulation of methods and seasons.

DEPARTMENT OF WILD LIFE AND FISHERIES

ENFORCEMENT DIVISION

Paul A. Voitier, *Director*

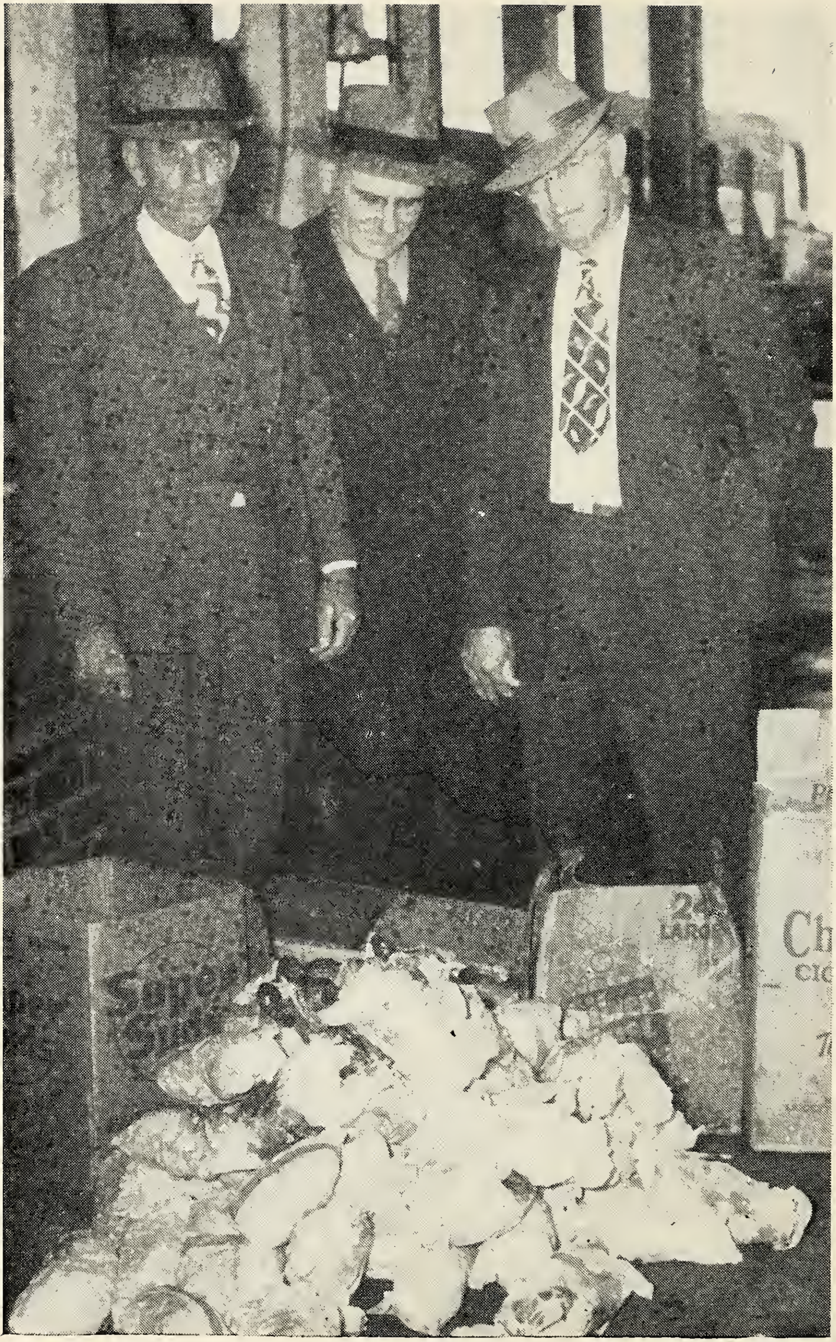


Paul Voitier

THIS report of the Enforcement Division covers the period beginning January 1, 1948, and ending December 31, 1949.

Functions of the Division are the enforcement of all laws protecting the wildlife, seafood and fur bearing resources of the State of Louisiana. The Division is subdivided into three sections, namely: Director's Office, Waterways Section, and Inland Section. Each section has its particular duties to perform.

The Director's office supervises and coordinates the activities of both Waterways and Inland Sections, and maintains all records of the personnel, equipment, field activities, court cases and dispositions of same. It also maintains public relations with individuals or associations interested in the protection of wildlife resources of the State. It inspects all processing plants of the commercial distributors of our seafoods and the refrigeration and storage space of all bird, waterfowl, game and seafood resources of the State.



Enforcement Director Paul Voitier, (center) with game agents Arthur Ewing (left) and Clarence Dyson, after a raid near Abbeville, La., in which they seized illegally possessed ducks in a Vermilion parish night club.

The Waterways Section is composed of a fleet of large and small boats which are used in patrolling the coastal waters and larger lakes and rivers of the State. In order to maintain this equipment in the best possible repair, a boat wharf with a complete machine and carpenter shop is maintained and is managed by a Wharf Superintendent and the necessary mechanics, carpenters and watchmen. This patrolling equipment is used in conjunction with our sea planes, which add greatly to the efficiency of our patrols and the enforcement of the conservation laws of the State.

The Inland Section is composed of the Wild Life enforcement agents assigned to the various parishes and the rangers who operate over the entire State.

This section is charged with law enforcement of all inland lakes, streams and woodland, and is divided into the eight congressional districts. There are supervisors in charge of various districts in the State, each of whom is responsible for the activities of the agents in his particular district. The rangers operate under the direct supervision of the director's office, functioning wherever necessary in any and all parts of the State, and assisting the district supervisors in any way necessary.

Due to the rapid increase of the processing and distributing of our seafood resources, this Division is in need of considerable expansion. In order to properly inspect and supervise this branch of our enforcement work, equipment should be greatly increased. The operations of this Division are continually increasing in order to keep pace with the exceptionally large increase in hunting and fishing as a means of necessary recreation throughout this State.

Because of the natural obstacles that constantly harass game wardens in Louisiana, law enforcement becomes an extremely difficult problem in this state. First of all is the tricky, wily maneuverings of the violator to avoid being overcome. Subterfuges, camouflage, secret prowlings, wilful misinterpretations, all add their share of deception for the escape of the culprit, but these are more or less standard methods of fish and game violators everywhere. Here in Louisiana all the regular gimmicks used to evade the law, are enhanced by the unusual terrain of the state. With so much marshland,

Fleet of amphibious airplanes operated by the department of Wild Life and Fisheries to enforce observance of the state's fish and game laws.

almost virgin jungle, dense forests, and countless bayous, lagoons, lakes and rivers, the violator has, for years, led game wardens a merry chase, and too often laughed up his sleeve at the fruitless efforts of the enforcement officer to apprehend him.

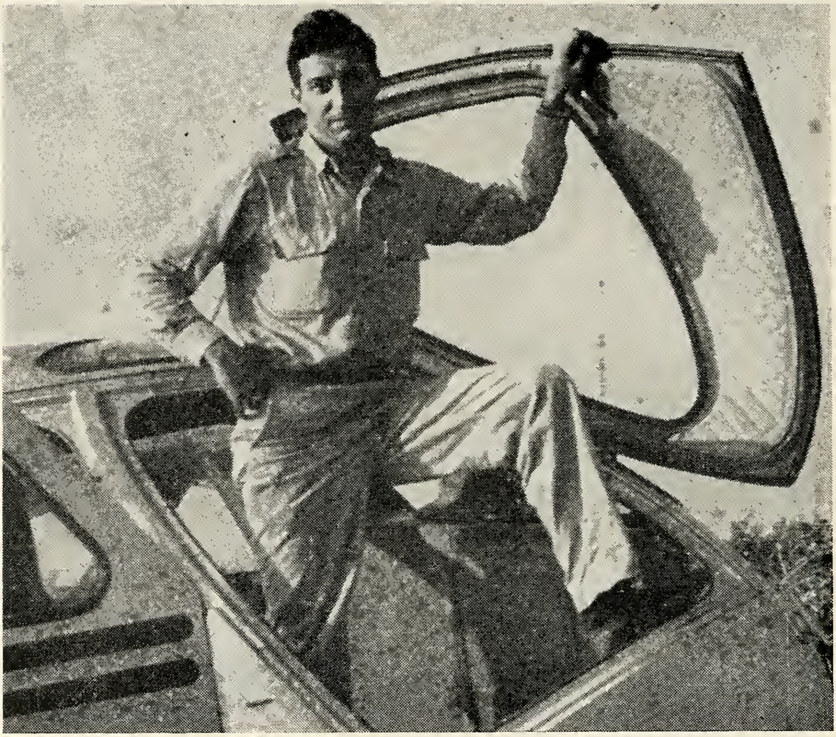
The best trained and most sincere game warden in the world is at a great disadvantage in ferreting out a law breaker who knows the marshes, reefs, myriads of bayous and dense jungle, as he knows the palm of his hand. Risking life and limb has been a general, rather than an unusual, practice among the wardens in their attempts to overhaul culprits.

More modern equipment, however, is steadily bringing about a change for the better. Faster boats must be employed to overhaul the speedy craft of the law breaker. Some shrimp, oyster and fish violators have high-powered motors in their trawl boats which turn up to a speed of 25 to 30 miles an hour. Enforcement agents in boats that can't make more than 20 miles, and in some instances boats that attain a maximum speed of eight to ten miles an hour, are virtually helpless when a chase develops. Add the willingness to risk reefs and mud flats to the violator's determination to escape and it can be seen it is futile as well as foolhardy for the game agents to endanger their boats and their own personal safety in pursuit.

Better boats ARE to be added to the law enforcement fleet as soon as possible, and radio will provide an additional enforcement facility.

All the airplanes, boats and some of the automobiles of the enforcement division are to be equipped with radio. Then it will be possible for planes to spot violators, radio the nearest boat and fix the exact location, when it is not possible to land the plane, and apprehend the violators on the spot. With all boats, planes and cars synchronized in a united effort through the medium of ship to shore . . . ship to ship . . . and ship to plane or cars, radio facilities, the fear of the law will strike deeper into the hearts of the lawless and the result is bound to be increased enforcement.

It will be possible also to use planes and their radio facilities in the upland portions of the state where violators have for years evaded punishment for their disregard of the law.



Nat Pedro, dean of the South's airplane pilots who is now a regular pilot for the state department of Wild Life and Fisheries.

"Flying Squadrons" of game wardens are being employed with excellent results in all parts of the state. These units are sent out from headquarters as special squads wherever violations of a considerable number are reported. Because they are not known in the areas into which they are rushed, they are able to avoid the identification which too many times warns the violator to get under cover, and in a few hours they have been known to entirely clean up communities where illegal hunting and fishing has been reported. The work of these squadrons is increasing daily and the effect is being felt throughout the entire state, with the result that much game and countless fish are being saved from illegal destruction.

In addition to the Inland Section and Waterways Section, the following report covers the activities of the Aviation Section in connection with Enforcement:

John Ellington, veteran pilot of World War II, now a regular pilot for the state department of Wild Life and Fisheries.

The years of 1948 and 1949 were marked by a great reduction in violations of the State and Federal fish and game laws. This was partially due to the improvement in the aviation section in the last two years.

In this streamlined world, flying game wardens are not exactly a new thing; but, the Louisiana Department of Wild Life and Fisheries is finding its flying wardens extremely valuable in the enforcement of the fish and game laws. And the law violator has found that the approaching drum of an airplane motor is a forerunner of disaster.

In the days before airplanes were put in use by the enforcement division of the Wild Life and Fisheries Department, fish

Enforcement Director Paul Voitier (right) and Assistant Director Julius Book, with wild ducks and shotguns seized by Book in a raid near Golden Meadow

Live trapped beaver ready for removal to new habitat.

and game violators played a merry game of tag with game wardens in the Louisiana bayous and marshes. Knowing the labyrinth of canals, bayous and lagoons as they knew the decks of their own boats, they had little difficulty in dodging enforcement officers. But they don't dodge the radio equipped planes.

Ducking into shallow bayous or marshes, where the patrol boats of the enforcement division can't go, doesn't give them sanctuary, either. A patrol plane pilot can spot the violator, radio his location and direct boat borne officers to him, if necessary. Or, if the water or terrain is suitable for landing, the flying warden can make the arrest himself.

The Department of Wild Life and Fisheries, Enforcement Division, now has two Seabees and the use of another Seabee and one Widgeon which is the property of the Oysters and Water Bottoms Division . . . all amphibious planes, for use twenty-four hours a day. And they have two of the most capable young pilots, and two mechanics to be found in the South. Two flying wardens and two mechanics make a team that is necessary to patrol the Louisiana waters and terrain in every section of the State.

Nat. P. Pedro, who has been flying for the department since 1947, comes from Shreveport in the northern part of the state, and John F. Ellington, who is from Plaquemines Parish, and knows the waters in that area like the palm of his own hand, has been with the department since 1948.

Both are of the temperament that makes them valuable as airplane patrol pilots, fearless without a bit of "daredevil" exhibitionism. Both earned their wings the hard way and the safe way.

The mechanics, Willard Eldredge and Clifford Salaun, who are both from New Orleans, must do an outstanding job in order that the constant patrols can be accomplished.

Due to the number of flights, the violations have been greatly reduced through a psychological viewpoint as well as actual arrests. Within a few hours the whole coast line can be patrolled thoroughly, whereas a boat would take a number of days and then not cover the area thoroughly. For example, there is a reported violation around the Black Bay area. Within thirty minutes after the report comes in, a plane could be at the location. Any other type of transportation would take a great number of hours.

No mention has been made until now of the actual use by the public of the planes, although approximately ten per cent (10%) of the total hours flown by the planes are done directly for the public, in performing various services for individuals such as rescue work before and after storms, work done during various floods, numerous searches for lost and drowned persons, searches for lost boats or boats overdue in their home port, assistance given various Federal agencies and also work done for other State agencies.

The following report of arrests will reflect a portion of the activities in the enforcement of the Louisiana laws pertaining to hunting, sport fishing, commercial fishing, shrimp, trapping, fur and hides:

PARISH	1948								1949							
	Judicial District	Number of Arrests	Number in District Court	Number Pending in District Court	Number Arrests in J. P. Court	Number Con-victions in J. P. Court	Number Pending in J. P. Court	Fines Collected in J. P. Court	Judicial District	Number of Arrests	Number in District Court	Number Pending in District Court	Number Arrests in J. P. Court	Number Con-victions in J. P. Court	Number Pending in J. P. Court	Fines Collected in J. P. Court
Caddo	1	....	....	....	....	....	....	....	1	14	14	1	....	....	....	....
Total	1	....	....	....	....	....	....	....	1	14	14	1	....	....	....	....
Bienville	2	16	3	....	13	13	....	300.00	2	6	5	....	1	1	....	25.00
Claiborne	2	7	....	....	7	7	....	150.00	2	3	....	....	3	3	....	75.00
Jackson	2	11	7	7	4	4	....	50.00	2	8	7	2	1	1	....	25.00
Total		34	10	7	24	24	....	500.00	2	17	12	2	5	5	....	125.00
Lincoln	3	17	17	9	....	....	....	....	3	8	8	6	....	....	....	....
Union	3	17	15	5	2	2	....	25.00	3	7	6	3	1	1	....	10.00
Total		34	32	14	2	2	....	25.00	3	15	14	9	1	1	....	10.00
Morehouse	4	12	5	5	7	7	....	257.50	4	30	16	4	14	14	....	150.00
Ouachita	4	78	34	32	44	44	....	550.00	4	23	13	8	10	10	....	125.00
Total		90	39	37	51	51	....	807.50	4	53	29	12	24	24	....	275.00
Franklin	5	23	10	9	13	11	2	150.00	5	14	12	3	2	1	1	12.50
Richland	5	19	....	....	19	18	1	325.00	5	9	2	2	7	7	....	125.00
West Carroll	5	5	2	....	3	3	....	37.50	5	3	....	....	3	3	....	75.00
Total		47	12	9	35	32	3	512.50		26	14	5	12	11	1	212.50

PARISH	1948								1949							
	Judicial District	Number of Arrests	Number in District Court	Number Pending in District Court	Number Arrests in J. P. Court	Number Convictions in J. P. Court	Number Pending in J. P. Court	Fines Collected in in J. P. Court	Judicial District	Number of Arrests	Number in District Court	Number Pending in District Court	Number Arrests in J. P. Court	Number Convictions in J. P. Court	Number Pending in J. P. Court	Fines Collected in J. P. Court
East Carroll	6	37	37	4	....	....	....	....	6	11	11	2	....	....	....	....
Madison	6	51	51	28	....	....	....	....	6	33	33	19	....	....	....	....
Tensas	6	27	27	19	....	....	....	....	6	69	69	51	....	....	....	....
Total		115	115	51	....	....	....	....		113	113	72	....	....	....	....
Catahoula	7	6	5	2	1	1	....	25.00	7	11	8	8	3	3	....	32.50
Concordia	7	54	25	....	29	29	....	520.00	7	66	40	8	26	26	....	357.50
Total		60	30	2	30	30	....	545.00		77	48	16	29	29	....	390.00
Grant	8	7	4	1	3	3	....	50.00	8	4	1	1	3	3	....	37.50
Winn	8	2	1	....	1	1	....	25.00	8	2	1	....	1	1	....	12.50
Total		9	5	1	4	4	....	75.00		6	2	1	4	4	....	50.00
Rapides	9	11	6	6	5	5	....	62.50	9	12	10	8	2	2	....	25.00
Total		11	6	6	5	5	....	62.50		12	10	8	2	2	....	25.00
Natchitoches	10	6	5	....	1	1	....	12.50	10	36	6	6	30	29	1	557.00
Red River	10	....	....	....	....	....	....	....	10	4	....	....	4	4	....	87.50
Total		6	5	....	1	1	....	12.50		40	6	6	34	33	1	644.50

PARISH	1948								1949							
	Judicial District	Number of Arrests	Number in District Court	Number Pending in District Court	Number Arrests in J. P. Court	Number Convictions in J. P. Court	Number Pending in J. P. Court	Fines Collected in J. P. Court	Judicial District	Number of Arrests	Number in District Court	Number Pending in District Court	Number Arrests in J. P. Court	Number Convictions in J. P. Court	Number Pending in J. P. Court	Fines Collected in J. P. Court
DeSoto	11	1	1	1	...	...	...	...	11	8	3	3	5	5	...	62.50
Sabine	11	5	1	1	4	4	...	50.00	11	2	...	...	2	2	...	25.00
Vernon	11	12	1	1	11	11	...	212.50	11	13	2	2	11	11	...	250.00
Total		18	3	3	15	15	...	262.50		23	5	5	18	18	...	337.50
Avoyelles	12	21	...	...	21	6	15	75.00	12	17	6	5	11	11	...	212.50
Total		21	...	...	21	6	15	75.00		17	6	5	11	11	...	212.50
Evangeline	13	15	7	7	8	7	1	75.00	13	15	1	1	14	14	...	160.00
Total		15	7	7	8	7	1	75.00		15	1	1	14	14	...	160.00
Allen	14	3	3	1	...	...	...	...	14	...	...	...	...	...	...	...
Beauregard	14	2	2	...	...	...	...	...	14	13	3	3	10	10	...	200.00
Cameron	14	...	...	...	...	...	...	...	14	...	...	...	...	...	...	...
Calcasieu	14	7	...	...	7	7	...	112.50	14	6	...	...	6	6	...	100.00
Jefferson Davis	14	...	...	...	...	...	...	...	14	1	...	...	1	...	1	...
Total		12	5	1	7	7	...	112.50		20	3	3	17	16	1	300.00
Acadia	15	...	...	...	...	...	...	...	15	...	...	...	...	...	...	...
Lafayette	15	...	...	...	...	...	...	...	15	1	...	...	1	...	1	...
Vermilion	15	...	...	...	...	...	...	...	15	14	9	8	5	5	...	95.00
Total		...	...	...	...	...	...	...		15	9	8	6	5	1	95.00

	1948								1949							
PARISH	Judicial District	Number of Arrests	Number in District Court	Number Pending in District Court	Number Arrests in J. P. Court	Number Con-victions in J. P. Court	Number Pending in J. P. Court	Fines Collected in J. P. Court	Judicial District	Number of Arrests	Number in District Court	Number Pending in District Court	Number Arrests in J. P. Court	Number Con-victions in J. P. Court	Number Pending in J. P. Court	Fines Collected in J. P. Court
Iberia	16	....	....	....	....	....	....	....	16	16	....	....	16	16	....	312.50
St. Martin	16	2	....	....	2	2	....	50.00	16	7	....	....	7	7	....	125.00
St. Mary	16	14	....	....	14	14	....	300.00	16	18	....	....	18	18	....	425.00
Total		16	....	....	16	16	....	350.00		41	....	....	41	41	....	862.50
Lafourche	17	14	....	....	14	14	....	237.50	17	15	....	....	15	15	....	287.50
Terrebonne	17	18	6	6	12	12	....	212.50	17	52	5	1	47	47	....	1,037.50
Total		32	6	6	26	26	....	450.00		67	5	1	62	62	....	1,325.00
Iberville	18	40	3	3	37	37	....	650.00	18	39	....	....	39	28	11	400.00
Pointe Coupee	18	53	....	....	53	53	....	962.50	18	52	12	12	40	40	....	850.00
West Baton Rouge	18	14	....	....	14	6	8	150.00	18	16	3	3	13	13	....	275.00
Total		107	3	3	104	96	8	1,762.50		107	15	15	92	81	11	1,525.00
East Baton Rouge	19	13	2	2	11	11	....	162.50	19	23	4	4	19	19	....	412.50
Total		13	2	2	11	11	....	162.50		23	4	4	19	19	....	412.50
East Feliciana	20	8	....	....	8	8	....	87.50	20	10	....	....	10	8	2	150.00
West Feliciana	20	8	....	....	8	8	....	112.50	20	8	....	....	8	8	....	175.00
Total		16	....	....	16	16	....	200.00		18	....	....	18	16	2	325.00

PARISH	1948								1949							
	Judicial District	Number of Arrests	Number in District Court	Number Pending in District Court	Number Arrests in J. P. Court	Number Convictions in J. P. Court	Number Pending in J. P. Court	Fines Collected in J. P. Court	Judicial District	Number of Arrests	Number in District Court	Number Pending in District Court	Number Arrests in J. P. Court	Number Convictions in J. P. Court	Number Pending in J. P. Court	Fines Collected in J. P. Court
Livingston	21	24	8	8	16	16	....	200.00	21	7	....	....	7	5	2	87.50
St. Helena	21	6	....	....	6	6	....	75.00	21	6	....	....	6	4	2	57.50
Tangipahoa	21	21	9	2	12	12	....	115.00	21	32	14	2	18	18	....	265.00
Total		51	17	10	34	34	....	390.00		45	14	2	31	27	4	410.00
St. Tammany	22	45	....	....	45	45	....	662.50	22	9	....	....	9	5	4	64.00
Washington	22	15	....	....	15	15	....	287.50	22	14	....	....	14	14	....	512.50
Total		60	....	....	60	60	....	950.00		23	....	....	23	19	4	576.50
Ascension	23	31	2	2	29	26	3	357.50	23	27	5	....	22	17	5	237.50
Assumption	23	22	16	....	6	6	....	125.00	23	7	....	....	7	7	....	100.00
St. James	23	4	....	....	4	4	....	50.00	23	9	2	....	7	7	....	87.50
Total		57	18	2	39	39	3	532.50		43	7	....	36	31	5	425.00
Jefferson	24	29	....	....	29	25	4	450.00	24	47	....	....	47	32	15	562.50
St. Charles	24	10	....	....	10	10	....	137.50	24	31	....	....	31	26	5	337.50
St. John	24	25	....	....	25	25	....	402.50	24	76	30	28	46	46	....	612.50
Total		64	....	....	64	60	4	990.00		154	30	28	124	104	20	1,512.50

PARISH	1948								1949							
	Judicial District	Number of Arrests	Number in District Court	Number Pending in District Court	Number Arrests in J. P. Court	Number Con-victions in J. P. Court	Number Pending in J. P. Court	Fines Collected in J. P. Court	Judicial District	Number of Arrests	Number in District Court	Number Pending in District Court	Number Arrests in J. P. Court	Number Con-victions in J. P. Court	Number Pending in J. P. Court	Fines Collected in J. P. Court
Plaquemines	25	10	8	8	2	2	....	25.00	25	20	11	11	9	8	1	145.00
St. Bernard	25	11	3	3	8	8	....	125.00	25	20	10	10	10	9	1	125.00
Total		21	11	11	10	10	....	150.00		40	21	21	19	17	2	270.00
Bossier	26	3	2	2	1	1	....	1.50	26	....	....	....	....	....	....	....
Webster	26	14	1	1	13	13	....	275.00	26	2	2	....	....	....	....	....
Total		17	3	3	14	14	....	276.50		2	2	....	....	....	....	....
St. Landry	27	40	....	....	40	40	....	750.00	27	19	3	3	16	15	1	350.00
Total		40	....	....	40	40	....	750.00		19	3	3	16	15	1	350.00
LaSalle	28	14	....	....	14	13	1	225.00	28	10	13	8	6	6	....	75.00
Caldwell	28	17	2	2	15	15	....	262.50	28	7	4	1	3	3	....	501.00
Total		31	2	2	29	28	1	487.50		26	17	9	9	9	....	125.00
Orleans Criminal District Court		2	2	2	....	....	....	....		29	29	25	....	....	....	....
Total		2	2	2	....	....	....	....		29	29	25	....	....	....	....

SUMMARY OF ALL JUDICIAL DISTRICTS

Number of Arrests from 1/1/48 to 12/31/48	1,076	
Number of Arrests from 1/1/49 to 12/31/48	1,278	
Total		2,354
Number of Cases in District Court 1/1/48 to 12/31/48	333	
Number of Cases in District Court 1/1/49 to 12/31/49	433	
Total		766
Number of Cases Pending in District Court from 1/1/48 to 12/31/48	179	
Number of Cases Pending in District Court from 1/1/49 to 12/31/49	262	
Total		441
Number of Cases in J. P. Court 1/1/48 to 12/31/48	666	
Number of Cases in J. P. Court 1/1/49 to 12/31/49	667	
Total		1,333
Number of Convictions in J. P. Court from 1/1/48 to 12/31/48	631	
Number of Convictions in J. P. Court from 1/1/49 to 12/31/49	613	
Total		1,244
Number of Cases Pending in J. P. Court from 1/1/48 to 12/31/48	35	
Number of Cases Pending in J. P. Court from 1/1/49 to 12/31/49	53	
Total		88
Fines Collected in J. P. Court from 1/1/48 to 12/31/48	$10,516.50	
Fines Collected in J. P. Court from 1/1/49 to 12/31/49	10,956.00	
Total		$21,472.50

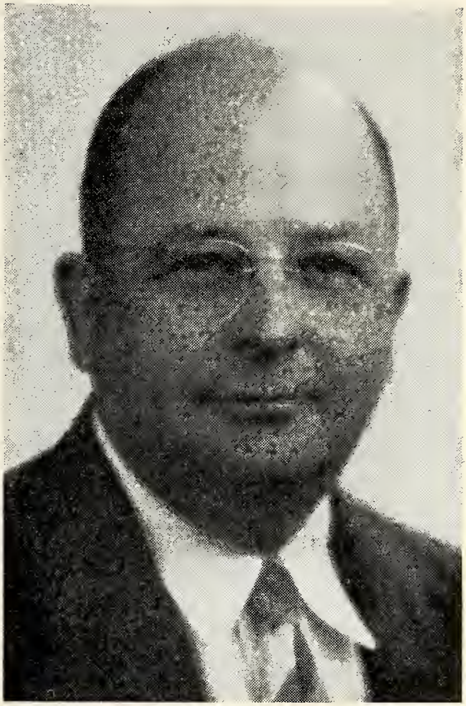
NOTE:—The above summary does not include Federal Cases as listed below:

Federal Cases from 1/1/48 to 12/31/48	77	
Federal Cases from 1/1/49 to 12/31/49	178	
Total		255

Deer being liberated in the Evangeline game preserve. (Above) Deer coming out of truck at express train speed while Roland Bass, (left) game agent looks on. (Lower left) earmarking deer before it is liberated. (Lower right) Transferring deer from one truck to another for removal to game preserve.

DIVISION OF FISH AND GAME

MAJOR JAMES BROWN, *Director*



Major James Brown

THE Division of Fish and Game has the responsibility of directing the program of the following sections:

Director's Office—New Orleans, Louisiana.

Biological Research—J. Nelson Gowanloch, Chief Biologist

Pittman Robertson (Federal Aid)—John S. Campbell, State Coordinator

Game, Distribution and Fish Rescue—Statewide

Water Hyacinth—Statewide

Predator Control—Statewide

L.S.U. Quail Hatchery—Baton Rouge.

Lacombe Quail Hatchery—Lacombe

Lacombe Fish Hatchery—Lacombe

Monroe Fish Hatchery—Monroe

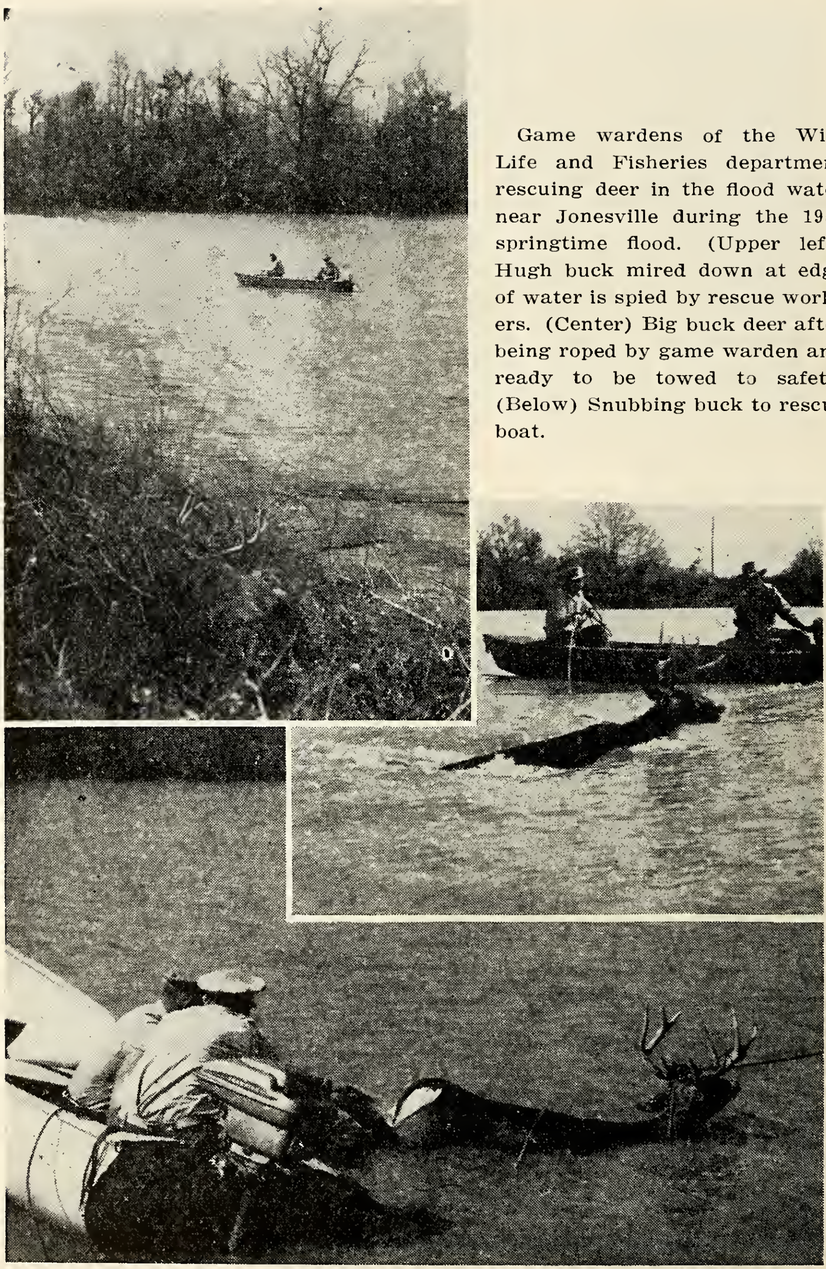
Beechwood Fish Hatchery—Forest Hill

Lake Bruin Fish Preserve—St. Joseph

Northwest Louisiana Fish and Game Preserve—Natchitoches

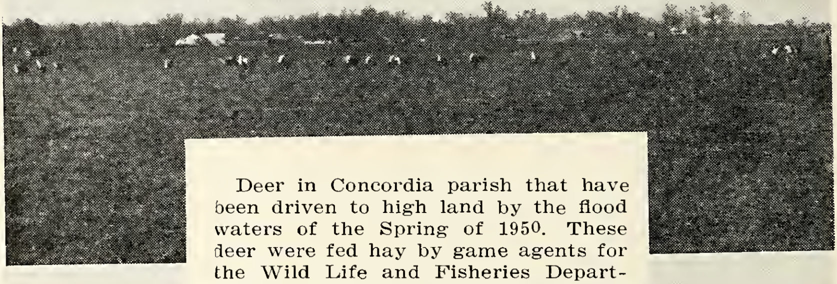
Lake Bistineau Fish and Game Preserve—McDade

Catahoula Lake Sanctuary—Deville



Game wardens of the Wild Life and Fisheries department rescuing deer in the flood water near Jonesville during the 1950 springtime flood. (Upper left) Hugh buck mired down at edge of water is spied by rescue workers. (Center) Big buck deer after being roped by game warden and ready to be towed to safety. (Below) Snubbing buck to rescue boat.

(Upper photo) State game wardens of the Wild Life and Fisheries department cruising in the Concordia parish flood waters looking for stranded or mired deer during the spring flood of 1950. (Center) Rescue workers easing up on big buck on bank of flood stream. (Below) Game Warden pulls cowboy methods in lassoing deer in flood waters. This deer was later towed to safety.



Deer in Concordia parish that have been driven to high land by the flood waters of the Spring of 1950. These deer were fed hay by game agents for the Wild Life and Fisheries Department to hold down the mortality until they could return to their native habitat.

Water Hyacinth Section

The Water Hyacinth program has progressed to a line well below Alexandria. Vast areas in Avoyelles and St. Landry Parishes have been cleared. All of the former infested areas north of this line have been constantly patrolled and the seedlings and regrowth destroyed wherever they appeared.

The use of 2-4D has definitely proved that the water hyacinth can be eradicated. The problem of the final and complete eradication is one of Management and Direction. The tremendous infestations in the Coastal Area will require a Coordinated program with the U. S. Engineers, the State, the Parish and all large users of our Coastal Areas.

The work of the last two years has definitely proved that where areas are cleared they can be maintained by a steadily diminishing patrol. As yet, we do not know how many years will be required, but we do know that the first year after clearance, a considerable amount of patrol work is required. The second year the patrol work is reduced by at least fifty per cent and the third year requires very little.

New equipment will be required. A combination cutting and spray barge is needed. Three mobile units equipped to properly carry out the patrol should be put in operation during the summer of 1950. Old and worn-out trucks and outboard motors will have to be replaced.

The U. S. Engineers have carried on an excellent research program and will present to the Congress of the United States a request for an appropriation to eradicate the Water Hyacinths and Alligator Weed. This request for that appropriation should be supported by the State of Louisiana.

Predator Control Section

This Section operates under funds provided by the $2.00 hunting license passed by the 1946 Legislature. This license was repealed in 1948 and the funds accrued for Predator Control will be exhausted by June 30, 1950. It is sincerely hoped that the Legislature of 1950 will provide the funds necessary to continue the Predator Control Program. This program is intended to keep our predators in balance and under proper control. Good game management requires this control.

PREDATOR CONTROL REPORT FOR 1948

NAME	Skunks	Wolves	Armadillos	Foxes	Bobcats	Crows	Hawks	Wild dogs	House cats	Opossums	Raccoons	Snakes	Owls	Half Wolf and Dog	Miscl.
Evans	8	15	29	19	..	1	..	5	2	..	4	..	2	..	..
Karam	6	..	389	14	..	..	..	..	..	..	..	..	..	..	..
Moffet	37	..	43	18	..	..	..	1	4	..	..	..	..	..	..
Miller	16	16	147	110	6	..	1	7	..	2	4	..	3	..	..
Lauzervich	10	..	..	..	..	29	16	1	..	..	..	..	..	..	..
Harris	28	16	61	50	8	..	..	..	..	2	3	..	..	..	..
	105	47	669	211	14	30	17	14	6	4	11	..	5	..	..

PREDATOR CONTROL REPORT FOR 1949

NAME	Skunks	Wolves	Armadillos	Foxes	Bobcats	Crows	Hawks	Wild dogs	House cats	Opossums	Raccoons	Snakes	Owls	Half Wolf and Dog	Miscl.
Johnson	32	..	72	..	..	..	14	..	..	..	..	37	..	..	..
Bass	..	..	175	102	3	..	..	..	..	..	..	..	..	..	..
McWilliams ..	1	..	..	..	..	4	3	..	19	..	..	..	..	..	..
Jones	42	..	1	6	3	3	18	..	13	..	..	27	19	..	..
Skains	1	..	1	75	2	..	..	..	2	..	4	..	..	..	..
Phillips	12	..	103	49	11	..	..	5	9	..	..	..	..	..	..
Neal	3	..	1	23	5	..	1	1	1	..	6	11	..	..	..
Myers	21	..	50	18	..	..	10	4	..	..	..	..	..	..	..
Moffit	45	10	70	31	7	..	4	3	2	..	..	7	..	..	..
Maddox	173	..	300	49	8	..	29	..	2	..	..	155	23	..	..
Lauzervich ...	68	1	1	7	6	55	33	..	..	..	..	..	..	..	104 outlaw nets 26 live beaver 11 gars
Harris	38	20	12	126	14	..	1	3	7	..	12	14	..	..	
Elliott	80	6	423	95	2	5	79	27	74	..	..	303	46	1	..
Blount	70	1	1	10	17	3	4	..	8	..	..	34	..	..	..
	586	38	1,210	591	78	70	196	43	137	..	22	588	88	1	141

Our Restocking Program and the new Game Refuge Program would be seriously handicapped if the Predator Control Program is not continued. The great saving in live stock to the farmers of the State must also be considered. The predators take a heavy toll not only of our game, but also of the calves, sheep, swine and poultry.

During the 1948-1949 Biennium, the trappers have destroyed 691 skunks, 85 wolves, 92 bobcoats, 1880 armadillos, 802 foxes, 213 hawks, 588 snakes, 93 owls, 143 wild housecats and many other predators such as crows, opossums and others where their concentrations have increased to the point that necessitated their control. The Outdoor Writers' Association of America, in June 1949, passed the following resolution: "Resolved that in view of the fact that many practical conservationists, with extensive experience in the field, view with alarm the tendency among some outdoor writers, likewise among government conservation officials, to accept with an attitude of complacency, the undisturbed presence of predators in game habitat, the O.W.A.A. go on record as sounding a word of alarm to such writers and conservation heads in areas where above conditions have become noticeably apparent."

Game and Fish Restocking Section

The Legislature of 1948 passed Act No. 70, approved by Gov. Earl K. Long, appropriating the sum of $150,000.00 for each fiscal year of the Bienium commencing July 1, 1950, out of the general fund to the Department of Wild Life and Fisheries for the purpose of purchasing quail, deer, turkey and other wild game, and restocking lakes and streams with fish.

All sources from which deer, turkey and quail could be purchased were contacted. Mexico prohibited the exportation of live-trapped wild quail. This country, for a number of years, had supplied an excellent quail trapped in the highlands of Mexico, a quail known as the Texas Bob-White quail, indistinguishable from our native Bob-White, except by an expert ornithologist. This action by Mexico prevented our purchasing live-trapped wild quail, so that the only quail we could purchase had to be obtained from commercial hatcheries in our own country.

In the spring of 1949, we purchased five thousand quail from Dr. Mike Hines who operates a quail hatchery in Abingdon, Virginia. In the late summer of 1949 another five thousand four-month's-old quail were purchased from him. Eight thousand quail were purchased from Hugh Bagby, Little Rock, Arkansas, and five thousand from Rube Hatcher, Charlotte, South Carolina. These twenty-three thousand quail were distributed throughout the State on the basis of best quail habitat and heaviest hunting concentrations. We are now receiving many bands from these banded quail and the letters from the quail hunters who are sending these bands in prove that these hatchery quail have joined our own native covies. The broad-distribution of these bands show that we have many sections of the State where hatchery-raised quail can and do survive. Without exception, the comments received state that the banded quail are in many instances larger than our native quail and all the hunters have stated that the banded quail were fat and healthy. The reports to date have been excellent and because of them, we have ordered twenty-five thousand quail to be delivered in the late summer and early fall of 1950.

Seven large Game Refuges and Game Management Areas have been established to provide areas for the restocking of deer and turkey. Four hunded and fifty-eight wild turkeys were purchased in Pennsylvania and West Virginia and liberated on these refuges. Two thousand turkeys have been contracted for delivery in the late summer and early fall of 1950. One hundred and twenty-four deer were liberated in the refuges and a few other areas. Forty deer were secured from Texas and fifteen from Wisconsin. Sixty-nine deer were trapped on private game parks and State Sanctuaries. Two hundred and ninety live-trapped squirrels were released from an order for one thousand given to a game dealer in Wisconsin.

The Fish Restocking Program has been increased by the addition of another seining crew established in the central part of the state. The two permanent and year-round seining crews have been equipped with the best live-fish transportation trucks that could be obtained. Four of these new units have been added to the fleet already in opration and the following tables show the results of the increased operation.

FISH DISTRIBUTION—1948

BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
5/11/48...	East Carroll	940	271	20	39			960	310	Free Land Pond	Morehouse
5/12/48...	East Carroll	1,250	252					1,250	252	Lake Providence	East Carroll
5/13/48...	East Carroll			31	60	550	137	581	197	New Park Lake	Calcasieu
5/14/48...	East Carroll	975	210	37	39			1,012	249	Lake Davis, Lake Lang	Caldwell
5/17/48...	East Carroll	1,270	220	46	61			1,316	281	Horseshoe Lake	Morehouse
5/18/48...	East Carroll	1,065	210	64	42			1,129	252	Lake Providence	East Carroll
5/19/48...	East Carroll	1,400	270	36	42			1,436	312	Clear Lake	Richland
5/20/48...	East Carroll	1,620	301	72	103			1,692	404	Horseshoe Lake	Morehouse
5/21/48...	East Carroll	2,300	312	27	21			2,327	333	Lake Providence	East Carroll
5/22/48...	East Carroll	1,200	200	60	63			1,260	263	Long Lake	Caldwell
5/22/48...	East Carroll	200	36	7	4			227	40	Lake Providence	East Carroll
5/24/48...	East Carroll	1,180	205	62	40			1,242	245	Lake Providence	East Carroll
5/25/48...	East Carroll	1,020	180	45	34			1,065	214	Anacoa Creek	Vernon
5/26/48...	East Carroll	1,840	300	12	8			1,852	308	Lake Providence	East Carroll
5/27/48...	East Carroll	1,160	205	68	27			1,228	232	Lake Providence	East Carroll
5/28/48...	East Carroll	1,420	260	47	68			1,467	328	Chicot Lake	St. Landry
5/29/48...	East Carroll	1,100	190	37	60			1,137	250	Chicot Lake	St. Landry
5/31/48...	East Carroll	562	275	26	20			588	295	Lake Lafourche	Morehouse
6/ 1/48...	East Carroll	1,500	180	18	12			1,518	192	Lake Providence	East Carroll
6/ 2/48...	East Carroll	1,231	286	66	32			1,297	318	Lake Providence	East Carroll
6/ 3/48...	East Carroll	680	136	10	4			690	140	Lake Ervin	Morehouse
6/ 4/48...	East Carroll	867	185	10	6			877	191	Lake Providence	East Carroll
6/ 5/48...	East Carroll	1,496	315	27	14			1,523	329	Lake Providence	East Carroll
6/ 7/48...	East Carroll	782	198	23	11			805	209	Lake Providence	East Carroll
6/ 8/48...	East Carroll	746	192	31	14			777	206	Lake Providence	East Carroll
6/12/48...	Beechwood Fish Hatchery	30	15	10	6	45	16	85	37	Indian Creek	Rapides
6/15/48...	East Carroll	2,040	402	4	9			2,044	411	Calcasieu River, Oakdale	Allen

FISH DISTRIBUTION—1948

BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
6/15/48	East Carroll	570	110	64	126			634	236	Calcasieu River, Oakdale	Allen
6/17/48	East Carroll	260	80	137	221			397	301	Calcasieu River, Oberlin	Allen
6/17/48	East Carroll	1,600	168					1,600	168	Lake Providence	East Carroll
6/19/48	Tensas	1,290	64	46	7			1,336	71	Lake Bruin	Tensas
6/21/48	East Carroll	160	34					160	34	Lake Providence	East Carroll
6/22/48	East Carroll	500	162	17	40			517	202	Whiskey Chitto River	Allen
6/23/48	East Carroll	370	117	124	200			494	317	Whiskey Chitto River	Allen
6/25/48	East Carroll	170	40	130	260			300	300	Whiskey Chitto River	Allen
6/25/48	East Carroll	740	130					740	130	Lake Providence	East Carroll
6/27/48	East Carroll	430	80	125	210			545	290	Lake Providence	East Carroll
6/28/48	East Carroll	2,100	300	68	100			2,168	400	Lake Providence	East Carroll
6/29/48	East Carroll	2,350	310	21	14			2,371	324	Lake Providence	East Carroll
7/ 5/48	East Carroll	1,100	240	14	21			1,114	261	Lake Providence	East Carroll
7/ 5/48	East Carroll	490	170	71	130			561	300	Calcasieu River	Allen
7/ 6/48	East Carroll	960	205	34	50			994	255	Lake Providence	East Carroll
7/ 6/48	East Carroll	678	226	165	250			843	476	Millers Lake	Evangeline
7/ 7/48	East Carroll	1,165	205	17	24			1,182	229	Lake Providence	East Carroll
7/ 7/48	East Carroll	210	85	127	200			337	285	Sabine, Old River	Beauregard
7/ 8/48	East Carroll	2,300	315					2,300	315	Lake Providence	East Carroll
7/ 8/48	East Carroll	550	170	325	415			875	585	Calcasieu River	Allen
7/ 9/48	East Carroll			160	327			160	327	Whiskey Chitto River	Allen
7/10/48	East Carroll	1,600	265	14	12			1,614	277	Lake Providence	East Carroll
7/10/48	East Carroll	650	206	270	278			920	484	Calcasieu River	Allen
7/12/48	East Carroll	400	95	250	205			650	300	Barnes Creek	Allen
7/12/48	East Carroll	2,350	470					2,350	470	Lake Providence	East Carroll
7/14/48	East Carroll	800	260	100	125			900	385	Chicot Park	Evangeline
7/14/48	East Carroll	600	120	63	75			663	195	Lake Providence	East Carroll

FISH DISTRIBUTION—1948

BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
7/15/48	East Carroll	1,000	200	125	215			1,125	415	Bear Lake	Madison
7/16/48	East Carroll			275	390			275	390	Calcasieu River	Calcasieu
7/16/48	East Carroll	2,500	510	12	15			2,512	525	Lake Providence	East Carroll
7/17/48	East Carroll	250	75	102	155			352	230	Lake Providence	East Carroll
7/19/48	East Carroll	800	175	75	50			875	225	Chicot Lake	Evangeline
7/20/48	East Carroll	1,200	240	14	15			1,214	255	Lake Providence	East Carroll
7/21/48	East Carroll	1,000	200	50	49			1,050	249	Sabine Old River	Beauregard
7/21/48	East Carroll	1,080	210	50	60			1,130	270	Lake Providence	East Carroll
7/23/48	East Carroll	3,000	440	10	8			3,010	448	Lake Providence	East Carroll
7/23/48	East Carroll			210	300			210	300	Whiskey Chitto River	Allen
7/24/48	Tensas	3	½	1	½	750	1,500	754	1,501	Tensas River	Tensas
7/24/48	Tensas					3,210	6,540	2,460	5,040	Killed—Gar, Grimmel and Turtles	
7/26/48	Tensas	70	17	3	1	1,072	2,100	1,082	2,118	Tensas River	Tensas
7/26/48	Tensas					560	1,050	560	1,050	Killed—Gar, Grimmel and Turtles	
7/26/48	Tensas					417	940	1,151	1,990	Killed—Gar, Grimmel and Turtles	
7/26/48	Tensas					174		174		Killed—Gar, Grimmel and Turtles	
7/27/48	Tensas	81	22	4	1	276	580	361	603	Tensas River	Tensas
7/27/48	Tensas					1,140	2,290	1,140	2,290	Killed—Gar, Grimmel and Turtles	
7/27/48	Tensas					760	1,550	877	1,550	Killed—Gar, Grimmel and Turtles	

FISH DISTRIBUTION—1948

BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
7/27/48	Tensas	23	9	1	1	950	2,100	974	2,110	Tensas River	Tensas
7/28/48	Tensas					465	1,500	979	2,850	Killed—Gar, Grimmels and Turtles	
7/28/48	Tensas					416	1,350	416	1,350	Killed—Gar, Grimmels and Turtles	
7/28/48	Tensas					98		98		Killed—Car, Grimmel and Turtles	
7/30/48	Tensas	470	114	136	73			606	187	Evangeline Park Lake	St. Mary
8/ 2/48	Tensas	1,200	140	150	65			1,350	205	Black Lake	Natchitoches
8/ 3/48	Tensas	1,350	143	125	45			1,475	185	Lake Bruin	Tensas
8/ 4/48	Tensas	1,600	200	203	62			1,803	262	Black Lake	Natchitoches
8/ 6/48	East Carroll	850	315					850	315	Horseshoe Lake	Morehouse
8/ 7/48	East Carroll	75	20	221	501			296	321	Calcasieu River	Calcasieu
8/12/48	East Carroll			2	1			2	1	Lake Providence	East Carroll
8/13/48	Tensas					45	200	45	200	Blue Hole	Tensas
8/14/48	Tensas	500	145	200	40			700	185	Bush Wick Creek	Calcasieu
8/24/48	Tensas	700	150	75	24			775	174	Beckwith Creek	Calcasieu
8/24/48	Tensas	800	160	75	24			875	184	Sulphur Reservoir	Calcasieu
8/26/48	Monroe Fish Hatchery					32,000	180	32,000	180	Bayou DeSaird	Ouachita
9/ 3/48	Tensas	775	205	17	6½	23	9	815	220½	Mill Pond	Sabine
9/11/48	LaSalle	2,800	700	1,600	800			4,400	1,500	Old River	LaSalle
9/15/48	Catahoula	4,950	1,230	35	45			4,985	1,275	Jones Bayou	Catahoula
9/16/48	Catahoula	1,900	600	24	20			1,924	620	Black Lake	Natchitoches
9/16/48	Catahoula	1,100	310	14	21			1,114	331	Jones Bayou	Catahoula
9/20/48	Catahoula	1,800	600	12	14			1,812	614	Sandy Lake	Catahoula
9/21/48	Catahoula	1,750	600	14	16			1,764	616	Kawanis Lake	Rapides
9/22/48	Catahoula	1,800	600	8	12			1,808	612	Black Lake	Natchitoches

FISH DISTRIBUTION—1948

BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
9/23/48...	Catahoula	1,800	570	14	16			1,814	586	Sandy Lake	Catahoula
9/23/48...	Catahoula	300	200	7	8			307	208	Vermilion River	Lafayette
9/24/48...	Catahoula	1,700	600	11	13			1,711	613	Bee Lake	Concordia
9/24/48...	Catahoula					4,700		4,700		Killed—Gars	
9/27/48...	Catahoula	1,300	650	24	18			1,324	668	Sandy Lake	Catahoula
9/27/48...	Catahoula					4,025	8,050	4,025	8,050	Killed—Gars	
9/28/48...	Catahoula	1,600	699	13	12			1,613	711	Sandy Lake	Catahoula
9/28/48...	Catahoula	1,500	700	17	28			1,517	728	Sandy Lake	Catahoula
9/30/48...	Catahoula	1,400	600	31	46			1,431	646	Sandy Lake	Catahoula
10/ 1/48...	Catahoula	1,700	705	6	11			1,706	716	Sandy Lake	Catahoula
10/ 6/48...	Catahoula	450	300	6	8			456	308	Big Lake	Catahoula
10/ 8/48...	Catahoula	900	600	12	16			912	616	Big Lake	Catahoula
10/ 8/48...	Catahoula					6,600	13,200	6,600	13,200	Killed—Gars	
10/11/48...	Catahoula	1,500	1,000	21	46			1,521	1,046	Euten Bayou	Catahoula
10/11/48...	Catahoula	450	300	5	9			455	309	Jones Bayou	Catahoula
10/15/48...	LaSalle	360	181	144	276			504	457	Sercuy Lake	LaSalle
10/25/48...	Tensas	1,250	520	68	185	500	205	1,818	910	Lake Bruin	Tensas
10/26/48...	Tensas	1,560	630	28	61	475	195	2,063	886	Lake Bruin	Tensas
10/27/48...	Tensas	1,670	523	46	80	200	22	1,916	625	Lake Bruin	Tensas
10/28/48...	Tensas	425	290	6	20			431	310	Doseman Lake	Evangeline
10/28/48...	Tensas	1,450	523	46	80			1,496	603	Lake Bruin	Tensas
10/29/48...	Tensas	250	175	6	15	250	75	306	265	Lake Bruin	Tensas
10/30/48...	Tensas	600	200	40	110	500	175	1,140	485	Doseman Lake	Evangeline
11/ 3/48...	Tensas	470	190	26	35	360	115	856	340	Lake Bruin	Tensas
11/ 3/48...	Tensas	300	200	6	12	200	50	506	262	Millers and Hunts Lakes	Claiborne
11/ 4/48...	Tensas	840	600					840	600	Lake Bruin.	Tensas
11/ 4/48...	Tensas	375	270					375	270	Lake Bruin	Tensas

FISH DISTRIBUTION—1948

BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
11/ 5/48...	Tensas					750	250	750	250	Wardville Ponds	Rapides
11/ 5/48...	Tensas			61	200			61	200	U. S. Fish Hatchery	Natchitoches
11/ 8/48...	Tensas	1,000	600					1,000	600	U. S. Fish Hatchery	Rapides
11/ 9/48...	Tensas	500	260	36	64			536	324	Lake Bruin	Tensas
11/ 9/48...	Tensas	800	450			200	150	1,000	600	Big Creek Lake	Rapides
11/10/48...	Tensas			84	275			84	275	U. S. Fish Hatchery	Natchitoches
11/10/48...	Tensas	825	510	27	78	256	100	1,108	688	Lake Bruin	Tensas
11/10/48...	Tensas	125	50	23	60	100	30	248	140	Doseman Lake	Evangeline
11/11/48...	Tensas	400	210			200	70	600	280	Lake Bruin	Tensas
11/11/48...	Tensas			118	310			118	310	U. S. Fish Hatchery	Natchitoches
11/12/48...	Tensas			112	300			112	300	U. S. Fish Hatchery	Natchitoches
11/12/48...	Tensas	1,240	510	225	95			1,465	605	Millers Lake	Evangeline
11/12/48...	Tensas	150	100					150	100	Big Creek	Rapides
11/15/48...	Tensas	500	270	22	44	150	80	672	390	Lake Bruin	Tensas
11/15/48...	Tensas	1,000	480	105	207			1,105	687	Chicot Park	Evangeline
11/15/48...	Tensas					800	260	800	260	U. S. Fish Hatchery	Natchitoches
11/15/48...	Tensas	500	270	22	40	150	70	672	380	Lake Bruin	Tensas
11/15/48...	Tensas					800	260	800	260	U. S. Fish Hatchery	Natchitoches
11/15/48...	Tensas	1,000	480	105	209			1,105	689	Chicot Park	Evangeline
11/17/48...	Tensas	500	270			100	40	600	310	Cocodria Bayou	Evangeline
11/17/48...	Tensas	425	225	42	80			465	315	Hunts Lake	Claiborne
11/17/48...	Tensas	475	227	27	41	135	65	637	333	Lake Bruin	Tensas
11/17/48...	Tensas	500	270			100	40	600	310	Cocodria Bayou	Evangeline
11/17/48...	Tensas	425	225	42	80			467	305	Hunts Lake	Claiborne
11/17/48...	Tensas	475	227	27	41	135	65	637	333	Lake Bruin	Tensas
11/22/48...	Monroe Fish Hatchery			10,312	351	7,650	300	17,962	651	Bayou Bartholomew	Ouachita
11/22/48...	Monroe Fish Hatchery			2,000	50			2,000	50	Bayou DeSaird	Ouachita

FISH DISTRIBUTION—1948

BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
11/23/48...	Monroe Fish Hatchery...			553	115	9,300	615	9,853	830	Bayou Bartholomew	Ouachita
11/24/48...	Monroe Fish Hatchery...			335	57	16,850	435	17,255	492	Bayou DeSaird	Ouachita
12/13/48...	Beechwood Fish Hatchery			2,725	120	4,025	60	6,775	180	Calcasieu River	Rapides
12/14/48...	Beechwood Fish Hatchery			3,000	110	4,000	40	7,000	150	Calcasieu River	Allen
12/15/48...	Beechwood Fish Hatchery			3,900	130	3,390	45	7,290	175	Calcasieu River	Rapides
12/16/48...	Beechwood Fish Hatchery			632	149	600	20	1,232	169	Calcasieu River	Allen
12/16/48...	Beechwood Fish Hatchery			2,367	105	8,500	85	10,867	190	Calcasieu River	Allen
12/16/48...	Beechwood Fish Hatchery			200	8	4,000	12	4,200	20	Spring Creek	Rapides
12/16/48...	Tensas..........	200	125	25	35	300	75	525	235	Lake Bruin	Tensas
12/16/48...	Tensas..........	300	300	20	35	150	50	475	385	Lake Bruin	Tensas
12/16/48...	Tensas..........	460	345	12	12	100	25	572	382	Lake Bruin	Tensas
12/21/48...	Tensas..........	600	400	12	18	150	35	762	453	Hoover Lake	Catahoula
12/21/48...	Lacombe Fish Hatchery..			81	78	48,000	120	48,081	198	Amite River	Livingston
12/21/48...	Lacombe Fish Hatchery..					32,000	80	32,000	80	Bogue Falaya	St. Tammany
12/21/48...	Lacombe Fish Hatchery..					32,000	80	32,000	80	Bogue Chitto River	Washington
12/22/48...	Lacombe Fish Hatchery..			170	50	48,000	120	48,170	170	Tangipahoa River	Tangipahoa
12/22/48...	Lacombe Fish Hatchery..			480	120	2,500	60	2,980	180	Amite River	Livingston
12/22/48...	Tensas..........	400	240			250	64	650	304	Hoover Lake	Catahoula
12/23/48...	Tensas..........	500	235			400	75	900	310	Hoover Lake	Catahoula
12/23/48...	Lacombe Fish Hatchery..			330	135	3,600	180	3,930	315	Bogue Chitto River	Washington
12/23/48...	Lacombe Fish Hatchery..			240	60	12,000	30	12,240	90	Bogalusa Creek	Washington
12/23/48...	Lacombe Fish Hatchery..			240	60	12,000	30	12,240	90	Pushepatata Creek	Washington
12/28/48...	Tensas..........	125	60	15	25	250	75	390	160	Saddle Tree Lake	Tensas
12/29/48...	Tensas..........	75	30	20	54	300	96	395	180	Saddle Tree Lake	Tensas
		127,244	37,358½	36,538	12,265	315,069	48,416	478,851	98,039½		

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BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
1/10/49	Tensas	600	300	14	24			614	324	Delta Field Lake	Webster
1/12/49	Tensas	800	350	5	12			805	362	Carrey Lake	Webster
1/14/49	Tensas	750	250	17	25			767	275	Sikes Lake	Webster
3/17/49	Tensas	36	30	35	70	27	10	98	110	Lake Bruin	Webster
3/18/49	Tensas	20	10	40	80	40	15	100	105	Lake Bruin	Webster
3/19/49	Tensas	60	40	50	90	12	5	122	135	Lake Bruin	Webster
4/14/49	Tensas	200	75	7	7	250	70	457	152	Boeuf River Cut Off	Richland
4/15/49	Tensas	400	250	17	25	150	75	567	350	Boeuf River Cut Off	Richland
4/19/49	Tensas	200	125	27	25	200	75	427	225	Boeuf River Cut Off	Richland
4/20/49	Tensas	300	250	10	20	225	100	535	370	Millers Lake	Claiborne
4/21/49	Tensas	100	100	16	35	600	285	716	420	Millers Lake	Claiborne
4/25/49	Tensas	200	150	40	60	350	150	590	360	Hunts Lake	Claiborne
4/26/49	Tensas	175	175	50	70	300	125	525	370	Carrey Lake	Webster
4/27/49	Tensas	125	125	47	85	300	150	472	360	Sikes Lake	Webster
4/29/49	Tensas	125	150	40	60	300	175	465	385	Delta Field Lake	Webster
5/ 3/49	Tensas	150	175	35	60	400	200	585	435	Boeuf River Cut Off	Richland
5/ 4/49	Tensas	125	100	40	65	300	175	465	340	Millers Lake	Claiborne
5/ 5/49	Tensas	100	100			1,050	350	1,150	450	Lake Bruin	Tensas
5/ 6/49	Tensas	100	100	40	85	700	250	840	435	Bayou Bartholomew	Ouachita
5/ 9/49	Tensas	325	250	40	75	700	350	1,065	675	Little Fork Bayou	Madison
5/10/49	Madison	950	700	3	15			953	715	Bayou DeSaird	Ouachita
5/11/49	Madison	475	375	6	20			481	395	Bayou Bartholomew	Ouachita
5/11/49	Madison	500	400	3	14			503	414	Cheniere Lake	Ouachita
5/12/49	Madison	700	500	2	7			702	507	Hoover Lake	Catahoula
5/13/49	Madison	450	375	4	15			454	390	Cheney Lake	Webster
5/13/49	Madison	475	350	4	12			479	362	Crew Lake	Richland
5/16/49	Madison	375	320	6	13			381	333	Crew Lake	Richland

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BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
5/16/49	Madison	325	275	12	20			337	295	Bayou Bartholomew	Ouachita
5/17/49	Madison	328	290	9	15			337	305	Carrey Lake	Webster
5/17/49	Madison	390	325					390	325	Bayou Bartholomw	Ouachita
5/18/49	Tensas	90	50	24	20	350	200	464	270	Chemin-a-Haut Lake	Morehouse
5/18/49	Tensas	150	100	19	15	300	150	469	265	Chemin-a-Haut Lake	Morehouse
5/19/49	Tensas	400	325	25	30	700	300	1,125	655	Chemin-a-Haut Lake	Morehouse
5/20/49	Tensas	375	375					375	375	Six Mile Creek	Allen
5/20/49	Tensas			25	20	600	300	625	320	Calcasieu River	Allen
5/24/49	Tensas	350	275					350	275	Lake Bruin	Tensas
5/24/49	Tensas	300	225	32	70			332	295	Bayou Bartholomew	Ouachita
5/25/49	Tensas	300	150					300	150	Saddle Tree Lake	Tensas
5/26/49	Tensas	400	300					400	300	Horseshoe Lake	Morehouse
5/26/49	Tensas					500	275	500	275	Big Lake	Franklin
5/27/49	Tensas					700	320	700	320	Horseshoe Lake	Morehouse
5/27/49	Tensas					650	275	650	275	Big Lake	Franklin
5/30/49	Monroe Fish Hatchery	35,000	350	18,000	180	20,000	400	73,000	930	Black Bayou	Ouachita
5/31/49	Monroe Fish Hatchery	80,000	800	40,000	700	40,000	400	160,000	1,900	Bayou DeSaird	Ouachita
6/ 1/49	Monroe Fish Hatchery	4,000	100	4,000	300			8,000	400	Chemin-a-Haut Lake	Morehouse
6/ 2/49	Monroe Fish Hatchery	50,000	500	25,000	400	25,000	250	100,000	1,150	Bayou Bartholomew	Ouachita
6/ 3/49	Monroe Fish Hatchery	15,000	150	8,000	160	7,000	70	30,000	380	Cheniere Lake	Ouachita
6/ 6/49	Tensas	150	100	31	40	175	90	356	230	Big Lake	Franklin
6/ 6/49	Tensas	200	125	40	50	100	40	340	215	Little Fork Bayou	Madison
6/ 7/49	Tensas	100	70	82	125	125	50	307	255	Boeuf River Cut Off	Richland
6/ 7/49	Tensas	150	100	75	120	200	95	425	315	Lake Despair	Madison
6/ 8/49	Tensas	300	300					300	300	Carrey Lake	Webster
6/ 9/49	Tensas			60	110			60	110	Whiskey Chitto River	Allen

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BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
6/ 9/49	Tensas			56	105			56	105	Ten Mile Creek	Allen
6/ 9/49	Tensas			64	125			64	125	Six Mile Creek	Allen
6/ 9/49	Tensas	150	75	32	60	250	100	432	235	Bayou Macon	West Carroll
6/10/49	Tensas	100	75	32	60	300	150	432	285	Boeuf River	West Carroll
6/13/49	Tensas	300	275					300	275	Bayou Macon	West Carroll
6/13/49	Tensas	255	200	52	125			307	325	Bayou Macon	East Carroll
6/14/49	Tensas	125	75	27	40	400	200	552	315	Bayou Macon	West Carroll
6/14/49	Tensas	200	100	19	35	350	175	569	310	Bayou Macon	West Carroll
6/15/49	Concordia	9,000	3,235	2,000	2,500	2,000	1,600	13,000	7,335	Concordia Bayou	Concordia
6/21/49	Tensas	175	100	107	165	200	80	482	345	Lake Louie	Catahoula
6/21/49	Tensas	125	70	24	30	500	200	649	300	Saddle Tree Lake	Tensas
6/22/49	Tensas	1,075	710	40	75	300	125	1,415	910	Lake Louie	Catahoula
6/23/49	Tensas	400	150	37	75	300	100	737	325	H. O. Parker Lake	Tensas
6/24/49	Tensas			177	320			177	320	H. O. Parker Lake	Tensas
6/24/49	Tensas	175	103			600	200	775	303	Tensas River	Franklin
6/24/49	Tensas	800	175	50	40	600	124	1,450	339	Indian Lake	Madison
6/24/49	Tensas	600	125	61	30	400	95	1,061	250	Indian Lake	Madison
6/27/49	Tensas	105	25	42	15	505	230	652	270	Boeuf River	West Carroll
6/27/49	Tensas	900	200					900	200	Boeuf River	Madison
7/ 6/49	Tensas	1,050	480	92	120			1,142	600	Horseshoe River	Morehouse
7/ 7/49	Tensas	930	534	137	178	130	40	1,197	752	Lake Despair	Madison
7/ 8/49	Tensas	375	210	31	45	322	126	728	381	H. O. Parker Lake	Tensas
7/ 8/49	Tensas	374	220	62	80	175	60	611	360	H. O. Parker Lake	Tensas
7/11/49	Tensas	1,600	250	30	40			1,630	290	Wells Lake	Catahoula
7/12/49	Tensas	2,700	425			1,800	225	4,500	650	Wells Lake	Catahoula
7/13/49	Tensas	300	150	175	200			475	350	Spears Lake	Claiborne

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BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
7/13/49	Tensas	1,200	125			900	125	2,100	250	Bayou Mason	East Carroll
7/14/49	Tensas	1,500	425	97	150	600	125	2,197	700	Spears Lake	Claiborne
7/15/49	Tensas	350	150	82	150	200	60	632	360	Clampitt Lake	Claiborne
7/15/49	Tensas	1,500	280					1,500	280	Saddle Lake	Tensas
7/18/49	Tensas	800	320	105	160	700	170	1,605	650	Chicot Lake Park	Evangeline
7/19/49	Tensas	675	290	80	120	700	250	1,455	660	Clampitt Lake	Claiborne
7/20/49	Tensas	900	250					900	250	Bayou Mason	West Carroll
7/21/49	Tensas	1,200	225					1,200	225	Bayou Mason	Franklin
7/22/49	Tensas	800	180			175	90	975	270	Tensas River	Franklin
7/25/49	East Carroll	107	25	10	20	75	20	192	65	Lake Providence	East Carroll
7/26/49	East Carroll	226	40					226	40	Lake Providence	East Carroll
7/27/49	East Carroll	80	20	15	15	60	20	155	55	Lake Providence	East Carroll
7/28/49	Tensas	900	420	72	100	400	100	1,372	620	Bayou Bartholomew	Ouachita
7/29/49	Tensas	900	400	31	40	800	275	1,731	715	Chemin-a-Haut Lake	Morehouse
8/ 1/49	Tensas	1,000	450	120	150	200	50	1,320	650	Chicot Lake	Evangeline
8/ 3/49	Tensas	800	425	40	60	600	200	1,440	685	Bayou Bartholomew	Ouachita
8/ 4/49	Tensas	425	250	35	50	900	350	1,360	650	Lake Louie	Catahoula
8/ 9/49	East Carroll	1,650	750					1,650	750	Lake Providence	East Carroll
8/10/49	East Carroll	1,375	650	31	40			1,406	690	Lake Providence	East Carroll
8/11/49	East Carroll	500	250	36	50			536	300	H. O. Parker Lake	Tensas
8/11/49	East Carroll	550	250	21	40			571	290	Lake Providence	East Carroll
8/12/49	East Carroll	475	225	20	30			495	255	Saddle Tree Lake	Tensas
8/12/49	East Carroll	220	100	15	20			235	120	Lake Providence	East Carroll
8/15/49	East Carroll	1,000	450	30	30			1,030	480	Lake Providence	East Carroll
8/16/49	East Carroll	400	175					400	175	Lake Providence	East Carroll
8/18/49	Tensas	600	300			100	50	700	350	Chemin-a-Haut Lake	Morehouse

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Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
8/18/49	Tensas			75	100	400	175	475	275	Old River	Beauregard
8/19/49	Tensas	200	150	35	50	400	150	635	350	Haynesville City Park	Claiborne
8/20/49	Tensas			75	40	158	375	233	415	Calcasieu River	Allen
8/22/49	Tensas	400	100	40	50	1,000	300	1,440	450	Boeuf River	West Carroll
8/24/49	Tensas	200	160	33	50	1,000	400	1,233	610	Old River	Beauregard
8/26/49	Tensas	200	100	30	50	600	200	830	350	City Park	Claiborne
8/26/49	Tensas	50	25	33	40	800	200	883	265	Chandler Lake	Claiborne
8/29/49	Tensas	200	75	67	110	1,000	400	1,267	585	Old River	Beauregard
8/31/49	Tensas	400	275	22	30			422	305	Lake Dean	Franklin
9/ 1/49	Tensas	600	300	31	40			631	340	Carrey Lake	Webster
9/ 1/49	Tensas	500	250			60	60	560	310	Horseshoe Lake	Morehouse
9/ 2/49	Tensas	475	275	30	35			505	310	Big Lake	Franklin
9/ 2/49	Tensas	600	300					600	300	Hoover Lake	Catahoula
9, 6/49	Tensas	500	300					500	300	Bear Lake	Madison
9/ 7/49	Tensas	925	550	36	50			961	600	Bear Lake	Madison
9/ 8/49	Tensas	200	100	38	60	400	125	638	285	Bear Lake	Madison
9/ 9/49	Tensas	390	250	16	25			406	275	Bayou Bartholomew	Morehouse
9/ 9/49	Tensas	225	150	14	28			239	178	Tensas River	Franklin
9/12/49	Tensas	600	300					600	300	Wells Lake	Catahoula
9/13/49	Tensas	700	350					700	350	Sikes Lake	Webster
9/14/49	Tensas	650	325					650	325	Boeuf River	West Carroll
9/14/49	Tensas	225	100					225	100	Lake Bruin	Tensas.
9/15/49	Tensas	400	200					400	200	Lake Louie	Catahoula
9/16/49	Tensas	750	350					750	350	Ten Mile Creek	Allen
9/16/49	Tensas	400	175					400	175	Indian Lake	Madison
9/19/49	Concordia	800	300					800	300	Lake St. John	Concordia

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Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
9/20/49	Concordia	1,100	400					1,100	400	Lake St. John	Concordia
9/21/49	Concordia	1,200	600	11	12	14	10	1,225	622	Lake St. John	Concordia
9/22/49	Concordia	1,400	600					1,400	600	Lake St. John	Concordia
9/23/49	Concordia	850	375					850	375	Lake Concordia	Concordia
9/26/49	Concordia	625	350			40	40	665	390	Lake Concordia	Concordia
9/26/49	Concordia	550	325			50	50	600	375	Lake St. John	Concordia
9/27/49	Tensas	300	175			450	175	750	350	Boeuf River	West Carroll
9/27/49	Tensas	375	200			400	175	775	375	Girl Scout Camp	Lincoln
9/28/49	Tensas	500	250					500	250	Tangipahoa River	Tangipahoa
9/28/49	Tensas					700	300	700	300	Chemin-a-Haut Lake	Morehouse
9/28/49	Tensas			93	150			93	150	Federal Fish Hatchery	Natchitoches
9/29/49	Tensas					800	300	800	300	Bear Lake	Madison
9/29/49	Tensas	300	150			400	125	700	275	Lake Dean	Franklin
9/30/49	Tensas			150	250			150	250	Federal Fish Hatchery	Natchitoches
9/30/49	Tensas	600	300			150	60	750	360	Girl Scout Camp	Lincoln
10/ 1/49	Tensas			2	13	550	250	552	263	State Park	Evangeline
10/ 1/49	Tensas	50	50			500	200	550	250	State Park	Evangeline
10/ 7/49	Tensas	175	100			475	200	650	300	Bear Lake	Madison
10/ 7/49	Tensas			100	175			100	175	Federal Fish Hatchery	Natchitoches
10/ 7/49	Tensas	150	75			500	200	650	275	Seagus Lake	Claiborne
10/10/49	Concordia	400	175			600	400	1,000	575	Lake Concordia	Concordia
10/11/49	Concordia	2,000	600					2,000	600	Lake St. John	Concordia
10/12/49	Concordia	475	275	20	20			495	295	Lake St. John	Concordia
10/13/49	Concordia	450	300					450	300	Lake Concordia	Concordia
10/13/49	Concordia	375	375					375	375	Tangipahoa River	Tangipahoa
10/14/49	Concordia	600	275					600	275	Wells Lake	Catahoula

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Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
10/17/49	Tensas	550	200	11	12			561	212	Bayou Macon	West Carroll
10/17/49	Tensas	300	150	17	20			317	170	Lake Leurie	Catahoula
10/18/49	Tensas	375	200					375	200	Chemin-a-Haut Lake	Morehouse
10/19/49	Tensas	425	175					425	175	Saddle Tree Lake	Tensas
10/20/49	Tensas	475	275			20	20	495	295	Bennie Field Lake	Claiborne
10/20/49	Tensas	125	75					125	75	Bayou Macon	Franklin
10/21/49	Tensas	375	300			43	43	418	343	Tangipahoa River	Tangipahoa
10/21/49	Tensas	223	100					223	100	H. O. Parker Lake	Tensas
10/24/49	Tensas	375	200	15	20	40	40	430	260	Bundick's Creek	Beauregard
10/26/49	Tensas	480	250			21	21	501	271	Bundick's Creek	Beauregard
10/26/49	Tensas	280	150					280	150	Indian Lake	Madison
10/27/49	Tensas	575	275					575	275	Tangipahoa River	Tangipahoa
10/27/49	Tensas					500	150	500	150	Lake Bruin	Tensas
10/28/49	Tensas	175	75	28	55	400	150	603	280	Royal Lake	Franklin
11/ 2/49	Tensas	400	200			200	75	600	275	Tangipahoa River	Tangipahoa
11/ 2/49	Tensas					600	275	600	275	Royal Lake	Franklin
11/ 2/49	Tensas			40	75			40	75	Federal Fish Hatchery	Natchitoches
11/ 3/49	Tensas	300	150	23	30	400	175	723	355	Girl Scout Camp	Lincoln
11/ 4/49	Tensas	500	300					500	300	Tangipahoa River	Tangipahoa
11/ 7/49	Tensas	50	20	10	12	150	40	210	72	Lake Bruin	Tensas
11/ 8/49	Tensas	600	325					600	325	Bennie Field	Claiborne
11/ 9/49	Madison	550	290					550	290	Carrey Lake	Webster
11/ 9/49	Madison	600	300	8	12			608	312	Tangipahoa River	Tangipahoa
11/10/49	Madison	100	40					100	40	Lake Bruin	Tensas
11/11/49	Madison	575	300	6	8			581	303	Tangipahoa River	Tangipahoa
11/11/49	Madison	700	300					700	300	Bear Lake	Madison

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Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
11/14/49	Madison	600	300					600	300	Big Lake	Franklin
11/14/49	Madison	400	280	26	30			426	310	Royal Lake	Franklin
11/17/49	Madison	650	325	35	40			685	365	Tangipahoa River	Tangipahoa
11/17/49	Madison	675	325	21	25			696	350	Whitfield Lake	West Carroll
11/21/49	Monroe Fish Hatchery			11,200	1,244			11,200	1,244	Bayou DeSaird	Ouachita
11/22/49	Monroe Fish Hatchery			3,867	966			3,867	966	Cheniere Brake	Ouachita
11/23/49	Monroe Fish Hatchery	2,000	333					2,000	333	Bayou Bartholomew	Ouachita
11/25/49	Monroe Fish Hatchery					19,000	950	19,000	950	Bayou Bartholomew	Ouachita
12/ 1/49	Tensas	400	300	32	45			432	345	Girls Scout Camp	Lincoln
12/ 2/49	Tensas	400	300	43	60			443	360	Tchefuncta River	St. Tammany
12/ 3/49	Tensas	450	320	28	45			478	365	Abita River	St. Tammany
12/ 6/49	Tensas	600	350	30	45			630	395	Tangipahoa River	Tangipahoa
12/ 7/49	Tensas	500	200	22	40			522	240	Bear Lake	Madison
12/ 8/49	Tensas	400	280	42	60			442	340	Tangipahoa River	Tangipahoa
12/ 9/49	Concordia	150	100	22	35			172	135	Lake St. John	Concordia
12/13/49	Tensas	300	200	45	60			345	260	Chemin-a-Haut Lake	Morehouse
12/14/49	Tensas					800	300	800	300	Chemin-a-Haut Lake	Morehouse
12/19/49	Lacombe Fish Hatchery			990	250			990	250	Amite River	Livingston
12/20/49	Lacombe Fish Hatchery			720	250	160	40	880	290	Bogue Chitto River	St. Tammany
12/20/49	Lacombe Fish Hatchery			500	150	400	100	900	250	Abita River	St. Tammany
12/20/49	Lacombe Fish Hatchery			320	80	400	100	720	180	State Park	St. Tammany
12/20/49	Lacombe Fish Hatchery			320	80	400	100	720	180	State Park	St. Tammany
12/21/49	Lacombe Fish Hatchery			425	120			425	120	Pushapatata Creek	Washington
12/21/49	Lacombe Fish Hatchery			425	120			425	120	Bogue Lusa River	Washington
12/21/49	Lacombe Fish Hatchery			790	200	300	60	1,090	260	Bogue Chitto River	Washington
12/22/49	Lacombe Fish Hatchery			780	205	200	40	980	245	Tangipahoa River	Tangipahoa

FISH DISTRIBUTION—1949
SEINING CREW NO. 1—JIM C. RHOADS, SUPERVISOR

BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
12/22/49...	Lacombe Fish Hatchery..	....	....	405	105	75	15	480	120	Mile Creek	St. Helena
12/22/49...	Lacombe Fish Hatchery..	....	....	415	110	75	15	490	125	Crittington Creek	St. Helena
12/22/49...	Lacombe Fish Hatchery..	....	....	720	180	300	72	1,020	252	Abita River	St. Tammany
12/23/49...	Lacombe Fish Hatchery..	....	....	782	254	....	....	782	254	Amite River	Livingston
12/29/49...	Lacombe Fish Hatchery..	....	....	810	264	....	....	810	264	Bogue Chitto River	St. Tammany
12/29/49...	Lacombe Fish Hatchery..	....	....	275	80	900	125	1,175	205	State Park	St. Tammany
12/29/49...	Lacombe Fish Hatchery..	....	....	145	40	1,100	150	1,245	190	Bayou Lacombe	St. Tammany
		278,769	46,470	125,563	15,947	155,777	19,416	560,109	81,833		

FISH DISTRIBUTION—1949
SEINING CREW NO. 2—RALPH BRIGGS, SUPERVISOR

BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
4/19/49	Natchitoches			9,000	10			9,000	10	Calcasieu River	Allen
4/28/49	Natchitoches			13,500	15			13,500	15	Saline Lake	Winn
5/ 3/49	Natchitoches			27,000	16			27,000	16	State Fish Hatchery	Tyler, Texas
5/ 4/49	Natchitoches			73,000	20			73,000	20	Cedar Lake	Rapides
5/ 4/49	Natchitoches			5,000	3			5,000	3	Wayne Wright Lake	Rapides
5/ 4/49	Natchitoches			5,000	3			5,000	3	Blue Hole	Avoyelles
5/ 5/49	Natchitoches			16,800	41			16,800	41	Valentine Lake	Rapides
5/ 6/49	Natchitoches			6,000	18			6,000	18	Down's Fish Pond	Grant
5/23/49	Monroe Fish Hatchery	12,500	125	6,250	62	6,250	62	25,000	249	Bayou DeSaird	Ouachita
5/24/49	Monroe Fish Hatchery	14,000	140	7,000	70	7,000	70	28,000	280	Bayou DeSaird	Ouachita
5/25/49	Monroe Fish Hatchery	13,500	125	6,250	62	6,250	62	26,000	249	Puckett Lake	Ouachita
5/25/49	Monroe Fish Hatchery	20,000	200	10,000	100	10,000	100	40,000	400	Clear Lake	Richland
5/26/49	Monroe Fish Hatchery	39,000	390	19,500	195	19,500	195	78,000	780	Chenier Lake	Ouachita
5/27/49	Monroe Fish Hatchery	51,500	315	25,750	257	25,750	257	103,000	829	Bayou DeSiard	Ouachita
5/28/49	Monroe Fish Hatchery	19,000	190	9,500	95	9,500	95	38,000	380	Cedar Lake	Rapides
5/30/49	Monroe Fish Hatchery	30,000	300	10,000	100			40,000	400	Bayou DeSaird	Ouachita
5/31/49	Monroe Fish Hatchery	20,000	200	800	80			20,800	280	Bayou DeSaird	Ouachita
6/ 1/49	Monroe Fish Hatchery	7,000	96	1,500	24			8,500	120	6 Mile Creek	Allen
6/ 3/49	Natchitoches			35,000	50			35,000	50	Saline Lake	Winn
6/ 6/49	Monroe Fish Hatchery	31,000	310	12,000	120	12,000	120	55,000	550	Clear Lake	Richland
6/ 7/49	Monroe Fish Hatchery	9,000	90	3,000	30	3,000	30	15,000	150	Valentine Lake	Rapides
6/ 7/49	Monroe Fish Hatchery	30,000	300	5,000	50	5,000	50	40,000	400	Johnson's Lake	Avoyelles
6/ 8/49	Monroe Fish Hatchery	15,000	150	3,000	30			18,000	180	Pump Canal	Allen
6/ 8/49	Monroe Fish Hatchery	15,000	150	4,000	40	5,000	50	24,000	240	Pucket Lake	Ouachita
6/ 9/49	Monroe Fish Hatchery	15,000	150	2,000	20	3,000	30	20,000	200	Bayou DeSaird	Ouachita
6/10/49	Monroe Fish Hatchery	11,000	110	1,000	10	3,000	30	15,000	150	Bayou DeSaird	Ouachita

FISH DISTRIBUTION—1949
SEINING CREW NO. 2—RALPH BRIGGS, SUPERVISOR

BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
6/21/49	Monroe Fish Hatchery	7,500	75	7,500	75			15,000	150	Chennie Lake	Ouachita
6/21/49	Monroe Fish Hatchery	7,500	75	7,500	75			15,000	150	Chennie Lake	Ouachita
6/22/49	Monroe Fish Hatchery	2,500	25	5,000	58	2,500	25	10,000	108	Hammett Lake	Richland
6/22/49	Monroe Fish Hatchery	3,500	35	7,000	70	3,500	35	14,000	140	Chenier Lake	Ouachita
6/23/49	Monroe Fish Hatchery	3,500	35	7,000	70	3,500	35	14,000	140	Black Bayou	Ouachita
6/27/49	Monroe Fish Hatchery	9,000	90	4,500	45	4,500	49	18,000	184	Bayou DeSaird	Ouachita
6/27/49	Monroe Fish Hatchery	9,000	90	4,500	45	4,500	45	18,000	180	Bayou DeSaird	Ouachita
6/28/49	Monroe Fish Hatchery	7,500	75	3,750	38	3,750	37	15,000	150	Bayou DeSaird	Ouachita
6/28/49	Monroe Fish Hatchery	7,500	75	3,750	38	3,750	37	15,000	150	Bayou Bartholomew	Ouachita
6/28/49	Monroe Fish Hatchery	2,500	25	1,250	13	1,250	12	5,000	50	Bayou DeSaird	Ouachita
6/29/49	Monroe Fish Hatchery	7,500	75	3,750	38	3,750	37	15,000	150	Chennie Lake	Ouachita
6/29/49	Monroe Fish Hatchery	7,500	75	3,750	38	3,750	37	15,000	150	Bayou Bartholomew	Ouachita
6/30/49	Monroe Fish Hatchery	15,000	150	7,500	75	7,500	75	30,000	300	Bayou Bartholomew	Ouachita
7/ 6/49	Monroe Fish Hatchery	10,000	100	100	10	400	40	10,500	150	Bayou Bartholomew	Ouachita
7/ 7/49	Monroe Fish Hatchery	15,000	300	200	40	300	60	15,500	400	Saline Lake	Winn
7/ 8/49	Monroe Fish Hatchery	15,000	150	200	20	300	30	15,500	200	Chicot Park	Evangeline
8/ 1/49	Catahoula	600	400					600	400	Jones Bayou	Catahoula
8/ 3/49	Catahoula	450	300					450	300	Houson Lake	Rapides
8/ 4/49	Catahoula					455	300	455	300	Jones Bayou	Catahoula
8/ 5/49	Catahoula	232	180					232	180	Saline Lake	Winn
8/19/49	LaSalle	500	300			500	300	1,000	600	Sercy Lake	LaSalle
8/22/49	LaSalle	475	290	325	160			800	450	Rogers Pond	LaSalle
8/23/49	LaSalle	290	100	135	100			425	200	Goodpine Mill Park	LaSalle
8/23/49	LaSalle	215	105	185	95			400	200	Saline Lake	Winn
8/24/49	LaSalle	415	200					415	200	Funislonie	LaSalle
8/24/49	LaSalle	100	55	300	145			400	200	Calcasieu River	Calcasieu

FISH DISTRIBUTION—1949
SEINING CREW NO. 2—RALPH BRIGGS, SUPERVISOR

BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
8/25/49	LaSalle	350	140	65	50			415	190	Goodpine Pond	LaSalle
8/26/49	LaSalle	300	115	135	85			435	200	Old River	LaSalle
8/26/49	LaSalle	345	125	180	75			525	200	Old Creek	LaSalle
8/26/49	LaSalle	300	135	100	65			400	200	Tall Pine Pond	LaSalle
8/29/49	LaSalle	210	75	90	90	100	35	400	200	Valentine Lake	Rapides
8/29/49	LaSalle	250	110	110	100	80	40	440	250	Rogers Pond	Rapides
8/30/49	LaSalle	200	80	150	100	50	20	400	200	Hickory Grove Pond	Rapides
8/30/49	LaSalle	306	80	95	100			401	180	Pat Edgar Pond	Rapides
8/31/49	LaSalle	234	100	112	90	36	10	382	200	Saline Lake	Winn
8/31/49	LaSalle	180	100	60	50	50	30	290	180	Goodpine Mill Pond	LaSalle
9/ 1/49	LaSalle	250	100	107	85	40	15	397	200	Black Lake	Rapides
9/ 2/49	LaSalle	175	75	150	125			325	200	Goodpine Mill Pond	LaSalle
9/ 7/49	Beechwood Fish Hatchery	300	60					300	60	Beth Bayou	Rapides
9/ 8/49	Beechwood Fish Hatchery	600	120					600	120	Old False River	Pointe Coupee
9/ 8/49	Natchitoches					3,100	25	3,100	25	L. S. U. Biology	E. Baton Rouge
9/13/49	Pointe Coupee	972	250					972	250	Old False River	Pointe Coupee
9/14/49	Pointe Coupee	805	180					805	180	Black Lake	Natchitoches
9/14/49	Pointe Coupee	950	200					950	200	Old False River	Pointe Coupee
9/15/49	Pointe Coupee	1,800	380					1,800	380	Old False River	Pointe Coupee
9/16/49	Pointe Coupee	833	180					833	180	James Lake	Rapides
9/16/49	Pointe Coupee	460	70					460	70	Marlowe Lake	Rapides
9/19/49	Pointe Coupee	924	300					924	300	Old False River	Pointe Coupee
9/20/49	Pointe Coupee	480	80					480	80	Marlowe Lake	Rapides
9/20/49	Pointe Coupee	562	200					562	200	Old False River	Pointe Coupee
9/21/49	Pointe Coupee	1,120	200					1,120	200	Morganza Spillway	Pointe Coupee
9/22/49	Pointe Coupee	732	180					732	180	Marlowe Lake	Rapides

FISH DISTRIBUTION—1949
SEINING CREW NO. 2—RALPH BRIGGS, SUPERVISOR

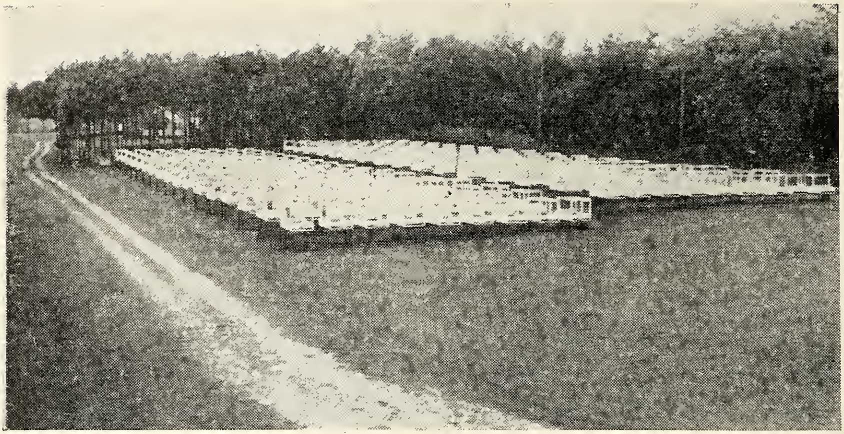
BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
9/22/49	Pointe Coupee	240	60					240	60	Morganza Spillway	Pointe Coupee
9/23/49	Pointe Coupee	683	180					683	180	Marlowe Lake	Rapides
9/26/49	Pointe Coupee	125	30					125	30	Morganza Spillway	Pointe Coupee
9/27/49	Pointe Coupee	325	60					325	60	Morganza Spillway	Pointe Coupee
9/28/49	Pointe Coupee	1,987	380					1,987	380	Old False River	Pointe Coupee
9/29/49	Pointe Coupee	678	180					678	180	Lake Concordia	Pointe Coupee
9/30/49	Pointe Coupee	1,553	440					1,553	440	Old River Salieno	Beauregard
10/13/49	Pointe Coupee	325		50		75		450	180	Armstrong Lake	East Carroll
10/14/49	Pointe Coupee	575		75		100		750	300	Ennis Laborde Lake	Avoyelles
10/17/49	Pointe Coupee	375		50		75		500	200	False River	Pointe Coupee
10/18/49	Pointe Coupee	375		50		75		500	200	False River	Pointe Coupee
10/19/49	Pointe Coupee	375		50		75		500	200	Circle Lake	Rapides
10/19/49	Pointe Coupee	375		50		75		500	200	Whatley Lake	Rapides
10/20/49	Pointe Coupee	375		50		75		500	200	False River	Pointe Coupee
10/21/49	Pointe Coupee	85		15		25		125	50	False River	Pointe Coupee
10/24/49	Pointe Coupee	560		75		110		745	300	False River	Pointe Coupee
10/25/49	Pointe Coupee	562		75		112		749	300	Mayor	DeRidder
10/26/49	Pointe Coupee	562		75		112		749	300	Valentine Lake	Rapides
10/27/49	Pointe Coupee	375		50		75		500	200	Saline Lake	Winn
10/28/49	Pointe Coupee	375		50		75		500	200	False River	Pointe Coupee
10/28/49	Pointe Coupee	375		50		75		500	200	Cedar Lake	Rapides
10/28/49	Pointe Coupee	560		110		75		745	300	Cedar Lake	Rapides
11/ 1/49	Pointe Coupee	475		75		50		600	300	Crazy Lake	Rapides
11/ 2/49	Pointe Coupee	250		70		80		400	200	Saline Lake	Winn
11/ 2/49	Pointe Coupee	475		75		50		600	300	False River	Pointe Coupee
11/ 3/49	Pointe Coupee	250		70		80		400	200	Cedar Lake	Rapides
11/ 4/49	Pointe Coupee	475		75		50		600	300	Catahoula	Rapides

FISH DISTRIBUTION—1949
SEINING CREW NO. 2—RALPH BRIGGS, SUPERVISOR

BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
11/ 7/49	Pointe Coupee	275		50		75		400	200	False River	Pointe Coupee
11/ 7/49	Pointe Coupee	400		75		125		600	300	Morganza Spillway	Pointe Coupee
11/ 8/49	Pointe Coupee	275		50		75		400	200	Morganza Spillway	Pointe Coupee
11/ 9/49	Pointe Coupee	400		75		125		600	300	Crazy Lake	Rapides
11/10/49	Pointe Coupee	400		75		125		600	300	Crazy Lake	Rapides
11/11/49	Pointe Coupee	550		100		150		800	500	Cedar Lake	Rapides
11/14/49	Pointe Coupee	275		75		150		500	250	Morganza Spillway	Pointe Coupee
11/15/49	Pointe Coupee	275		75		150		500	250	DeRidder	Beauregard
11/16/49	Pointe Coupee	125		25		50		200	100	Morganza Spillway	Pointe Coupee
11/16/49	Pointe Coupee	425		50		125		600	300	False River	Pointe Coupee
11/17/49	Pointe Coupee	275		75		150		500	250	School Board	Winn
11/17/49	Pointe Coupee	275		50		175		500	250	Cannon Camp	Pointe Coupee
11/18/49	Pointe Coupee	275		50		175		500	250	Valentine Lake	Rapides
11/21/49	Pointe Coupee	280		30		90		400	200	Valentine Lake	Rapides
11/21/49	Pointe Coupee	280		30		90		400	200	False River	Pointe Coupee
11/22/49	Pointe Coupee	280		30		90		400	200	Carenco Lake	Lafayette
11/22/49	Pointe Coupee	325		50		125		500	250	Morganza Spillway	Pointe Coupee
11/23/49	Pointe Coupee	280		30		90		400	200	Lake Success	Grant
11/28/49	Catahoula	200						200	200	Round Lake	Rapides
11/28/49	Catahoula	200						200	200	Brewton Camp	Winn
11/29/49	Catahoula	200						200	200	Rep. Walker	Grant
11/29/49	Catahoula	200						200	200	Sandy Lake	Catahoula
11/29,49	Catahoula	200						200	200	Jones Bayou	Catahoula
11/30/49	Catahoula	200						200	200	Lost Horsel	Rapides
11/30/49	Catahoula	200						200	200	Big Creek	Grant
12/ 1/49	Catahoula	200						200	200	Jones Bayou	Catahoula
12/ 1/49	Catahoula	200						200	200	Lake Success	Rapides

FISH DISTRIBUTION—1949
SEINING CREW NO. 2—RALPH BRIGGS, SUPERVISOR

BORROW PITS		WHITE PERCH		TROUT		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
12/ 2/49	Catahoula	200						200	200	Essler Field	Rapides
12/ 5/49	Catahoula	200						200	200	Lake Success	Rapides
12/ 5/49	Catahoula	200						200	200	Saline Lake	Winn
12/ 6/49	Catahoula	200						200	200	Simpson Lake	LaSalle
12/ 6/49	Catahoula	200						200	200	Big Creek	Grant
12/ 7/49	Catahoula	200						200	200	Clear Lake	Natchitoches
12/ 7/49	Catahoula	200						200	200	Sandy Lake	Catahoula
12/ 8/49	Catahoula					200		200	200	Jones Bayou	Catahoula
12/ 8/49	Catahoula	200						200	200	Iatt Lake	Grant
12/ 9/49	Catahoula	200						200	200	Saline Lake	Winn
12/ 9/49	Catahoula					200		200	200	Jones Bayou	Catahoula
12/12/49	Catahoula	200						200	190	Saline Lake	Winn
12/12/49	Catahoula	200						200	200	Jones Bayou	Catahoula
12/13/49	Catahoula			732		825		1,557	100	Paul Carter	Beauregard
12/13/49	Catahoula	200						200	200	Tylor Lake	Catahoula
12/16/49	Beechwood Fish Hatchery			160		859		1,019	25	M. P. Arnold	Rapides
12/17/49	Beechwood Fish Hatchery	3,000		690				3,690	85	Vincent R. Res.	Allen
12/19/49	Beechwood Fish Hatchery	825		845				1,670	85	A. C. Stewart	Beauregard
12/21/49	Beechwood Fish Hatchery	2,825		510				3,335	65	J. H. Anderson	Vernon
12/21/49	Beechwood Fish Hatchery	3,520		1,317				4,837	75		Allen
12/29/49	Beechwood Fish Hatchery					460		460	35	Eisler	Rapides
12/29/49	Beechwood Fish Hatchery			126				126	100	Charles Hoover	Calcasieu
	Total Crew No. 2	533,200	11,868	392,814	3,780	169,309	2,480	1,095,323	32,140		
	Total Crew No. 1	278,769	46,470	125,563	15,947	155,777	19,416	560,109	81,833		
	Total 1949	811,969	58,156	525,377	19,727	325,086	22,396	1,655,432	113,973		



Outdoor brooders at L.S.U. state hatchery for young quail.

Quail Distribution

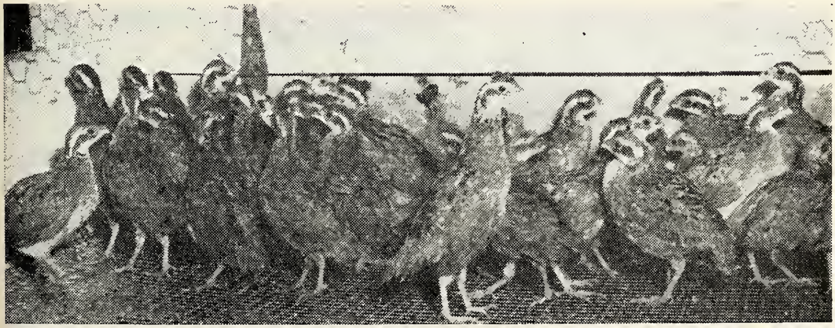
The Quail Hatchery at Baton Rouge was handicapped by the untimely death of a fine and efficient hatchery manager, Mr. Fred Pace, who died while delivering a truck load of quail from the hatchery. New personnel had to be trained for the operation of this unit and we hope to have this unit back to full capacity this coming season. In the spring of 1948, three thousand two hundred and eighty-eight quail were distributed from the hatch of 1947. In the fall of 1948, two thousand four hundred and forty were distributed. In the spring of 1949, one thousand seven hundred and seventy-six quail were distributed and in the fall of 1949, two thousand five hundred and seventy-four quail were distributed.

The Lacombe Quail Hatchery produced seven hundred and thirty-eight quail in the spring of 1948 and three hundred and fifteen quail in the fall of 1948. In the spring of 1949, eight hundred and forty-eight were distributed and in the fall of 1949, only one hundred and sixty-two quail were produced and distributed. This was due to the illness of the hatchery manager and an outbreak of quail disease that killed the balance of the 1949 hatch.

Total Distribution 1948—Both Hatcheries	6,771 quail
Distribution 1949—Both Hatcheries	5,360 quail
Distribution 1949—Purchased	23,000 quail
Total Distribution 1949	28,360 quail

Lake Bruin Fish Preserve
Catch and Licenses

Month	Licenses		Species	
	Non-Resident	Resident	Bass	Crappie
January 1948	44	21	296	171
February "	92	36	497	452
March "	167	148	942	2,078
April "	249	197	1,462	3,321
May "	263	249	1,942	3,281
June "	195	254	1,428	2,610
July "	175	319	1,545	2,290
August "	172	168	1,544	1,645
September "	162	121	1,317	1,292
October "	209	158	1,675	1,726
November "	117	64	1,040	657
December "	104	27	749	263
Total 1948	1,949	1,762	14,437	19,786
January 1949	56	48	493	244
February "	172	71	1,347	217
March "	144	63	896	453
April "	221	135	1,466	1,454
May "	298	202	1,603	1,718
June "	190	230	1,495	2,294
July "	349	353	1,841	2,716
August "	289	217	2,365	1,805
September "	217	158	1,908	1,279
October "	218	134	1,825	1,038
November "	201	103	1,444	1,248
December "	85	66	673	640
Total 1949	2,440	1,780	17,356	15,106



Young quail in Wild Life and Fisheries hatchery at L.S.U.

One of the wildlife exhibits that is shown under the supervision, of the Division of Education and Publicity, at various state events throughout the year

FEDERAL AID IN WILD LIFE RESTORATION

(Pittman-Robertson)

REPORT OF PROGRESS

1948-1949

Prepared by

JOHN S. CAMPBELL

State Coordinator, Federal Aid

In preparing this report, it was essential that a concise account be presented on each of the existing projects so as to emphasize the full value of the program. To do this, each activity under its respective heading is treated by outlining procedure and compiling data and suggestive recommendations. Adequate charts, graphs, tables and maps have been provided to simplify the contents.

As it is a basic requirement that all Federal Aid projects be of substantial character and design, it becomes necessary that they be listed under one of the five groups as follows:

(1) Land acquisition
(2) Land development
(3) Investigations and surveys
(4) Coordination
(5) Maintenance

Activities for this biennium have been confined to four of this group; namely, (1) Land acquisition (by lease); (2) Land development; (3) Investigations and surveys; and (4) Coordination.

Coordination and Land Acquisition

Project 10-C, State Coordination

Leader: John S. Campbell

Due to the increase in annual apportionments to the state from federal funds and the expansion of the Federal Aid Program the Department initiated a Coordination Project July 1,

1946. The project has been in existence since this date and will continue as long as there is justification for it.

This project is responsible to the Department for the efficient management affecting an overall wildlife restoration program. Its primary function is to coordinate all activities under Federal Aid so as to obtain the best results and receive the greatest benefit for monies spent.

At the outset of this project July 1, 1946 there were seven projects in existence, five research and two development. Since that date five of these projects have expired and three of this five are awaiting publication. At the date of this report there are fourteen projects in operation, namely:

Name and Number	Cost Outlay (1949-50)
1-R, Publication (Fur Resources Management Investigation)	$ 8,801.50
6-D, Farm Game Habitat Improvement	37,643.35
8-R, Wildlife Inventory and Management.	6,985.00
10-C, State Coordination	14,479.50
12-D, Red Dirt Wildlife Management Preserve	34,675.30
14-D, Deer Trapping and Transplanting	26,628.80
15-R, Mourning Dove Study	18,100.00
16-D, West Bay Game Refuge	7,103.80
17-R, Migratory Waterfowl Investigation	12,831.50
18-D, National Catahoula Wildlife Management Preserve	31,054.10
19-D, Evangeline Wildlife Management Area	37,557.69
20-D, Caldwell Parish Game Refuge No. 1	7,337.00
21-D, Livingston Parish Game Refuge	9,080.50
22-D, Union Parish Game Refuge No. 1	8,354.50
Total Cost Obligation	$260,623.54

To expedite the progress of this project and to coordinate the activities of other projects, a program has been provided whereby responsibilities and duties have been delegated to project personnel. The overall program has been arranged into four categories, namely: (1) Restocking and Land Acquisition, Flavil D. Hollis in charge, (2) Land Development and Refuge Management, Carroll J. Perkins in charge, (3) Farm Game

Habitat Improvement, Charles R. Shaw in charge, and (4) Research, Dr. Lyle S. St. Amant in charge. In this manner the function of this project is channeled through the four major phases of work and is under constant supervision of field personnel.

The fiscal phase of the coordination project is administered by an accountant who is responsible for accurate disbursement of funds and preparing reimbursement vouchers. The fiscal section also prepares all purchase orders and pay rolls for project personnel. A full time secretary is assigned to the project to handle correspondence, filing and miscellaneous details.

The volume of work assigned to coordination is constantly expanding because of the increasing demands for more management and development work throughout the State.

Land Development (Farm Game)

Project 6-D, Farm Game Habitat Improvement

Leader: Charles R. Shaw
Assistant Leader: Jack Sims

The work of farm game habitat improvement has expanded at least fourfold during the years of 1948 and 1949, despite a severe drought during 1948. This improvement cannot be attributed to any one factor but to a combination of favorable circumstances such as excellent cooperation of the Soil Conservation Service personnel and of the Agricultural Extension Service of the Louisiana State University.

The early work on this project was begun in 1942 with the distribution of a small amount of serecia lespedeza seed to a few Soil Conservation Service work units. In 1943, twenty-eight parishes participated, using 48,550 pounds of serecia seed and 388,400 pounds of 4-12-4 commercial fertilizer. The war effort precluded any great expansion during the next three years.

During this period lespedeza bicolor had become recognized as an important food and cover plant in the field border program. In 1946, six Soil Conservation Service work units planted 531 pounds of bicolor seed and 1,760 pounds of serecia seed, using 15,500 pounds of 4-12-4 fertilizer. The distribution of fertilizer

This is a field border of sericea lespedeza which offers both food and cover for bobwhite quail. Such borders as this and lespedeza bicolor are being established all over Louisiana on Project 6-D. (See Map).

was discontinued in 1947 but sixteen Soil Conservation Service work units continued with the planting of 4,000 pounds of bicolor seed and 1,064 pounds of serecia seed in field border strips.

This season also marked the beginning of the use of bicolor seedlings in Louisiana. Some 30,000 seedlings were used to establish 25 borders in the Ringgold and Ruston areas. These had been furnished by the Soil Conservation Service nursery at Minden. Two bicolor seed increase plots were established, one at Minden on the Soil Conservation Service Land Utilization Project at Caney Lake, the other on the Lake Bruin Fish Hatchery area at St. Joseph.

In February, 1948, an Assistant Project Leader was hired and additional equipment consisting of a ¾ ton truck, a tilt-type equipment trailer, and a tractor with plow, disc, harrow, etc., was secured.

During this month the Project Leader and Assistant procured 200,000 lespedeza bicolor seedlings from growers in Georgia purchased at a cost of $2.50 per thousand. As the lifting of these seedlings had already been delayed by bad weather, it was necessary to complete the distribution as rapidly as possible. An additional 17,000 seedlings were secured from the Soil Conservation Service nursery at Minden and 10,000 seedlings from Ringgold, giving a total of 227,000 seedlings distributed through the farm game program. The 4,000 pounds of serecia seed was obtained from the Belt Seed Company of Baltimore, Maryland. The distribution of the planting material to the various Soil Conservation Service work units was as follows:

Work Unit	Bicolor (Seedlings)	Serecia Seed (Pounds)
Jena	20,000	200
Tallulah	25,000	500
Oak Grove	5,000	100
Bastrop	20,000	300
Farmerville	21,000	300
Bernice	5,000	100
Minden	2,000	100
Shreveport	4,000	100
Mansfield	26,000	600
Coushatta	20,000	200
Winnfield	10,000	200
Alexandria	25,000	600
Ringgold	18,000	200
DeRidder	10,000	200
Gibsland	1,000	100
Franklinton	5,000	
Total	217,000	3,800
Experimental and miscellaneous plantings	10,000	

The addition of seedlings secured privately by several landowners brought the total number of plants transplanted in the state to approximately a quarter of a million. The Webster Parish Wildlife Association planted 200 pounds of serecia seed on a number of commercial pipe-line right-of-ways. The material distributed through this program was planted in March, although some of the privately acquired material was planted much later.

The constant work of expanding the program into new areas occupied much of the time of the project personnel. It was during this year (1948) that it was decided to include the Agricultural Extension Service in the farm game habitat im-

Lespedeza sericea (top) and Lespedeza bicolor (bottom) food strips on Red Dirt Wildlife Management Preserve.

provement program. The Assistant Project Leader taught a game management course at the annual 4-H Wildlife Camp and at the 4-H Forestry Camp. The interest and enthusiasm of the County Agents and the 4-H Club members indicated that their inclusion in our program would enable us to reach many areas of the state that we had not yet included. With the addition of the new cooperating agency, our program for the following season was more than doubled.

The Assistant Project Leader moved his domicile to Minden in the Northern section of the state when it was decided to divide the state into two areas with the Project Leader working in the southern portion of the state where new work programs were being planned.

On August 1, 1948, however, the original Project Leader resigned to accept a position with the U. S. Fish and Wildlife Service as Associate Federal Aid Supervisor for Region II, thus reducing the personnel of this project to only one man. It was eleven months before another Assistant Project Leader was secured and this reduction of personnel doubled the scope of the farm game habitat work on limited personnel. Most of the emphasis at this time was being placed on expansion with a goal of one million seedlings to be planted in one thousand border strips over the state in the 1949 season.

The severe drought during the summer of 1948 also had a serious effect on the program, retarding the growth of the field borders in many parts of the state. This was particularly true where planting instructions had been ignored and proper maintenance poorly carried out. The drought also curtailed seed reproduction on the Minden seed plot to the extent that it was not possible to harvest enough seed to make the operation profitable. The seed plot at St. Joseph promised a fair amount of seed but the combination of an early frost and two violent windstorms reduced the amount of seed left and the plants to naught. Arrangements were then made to purchase the required amount of seed from out-of-state growers.

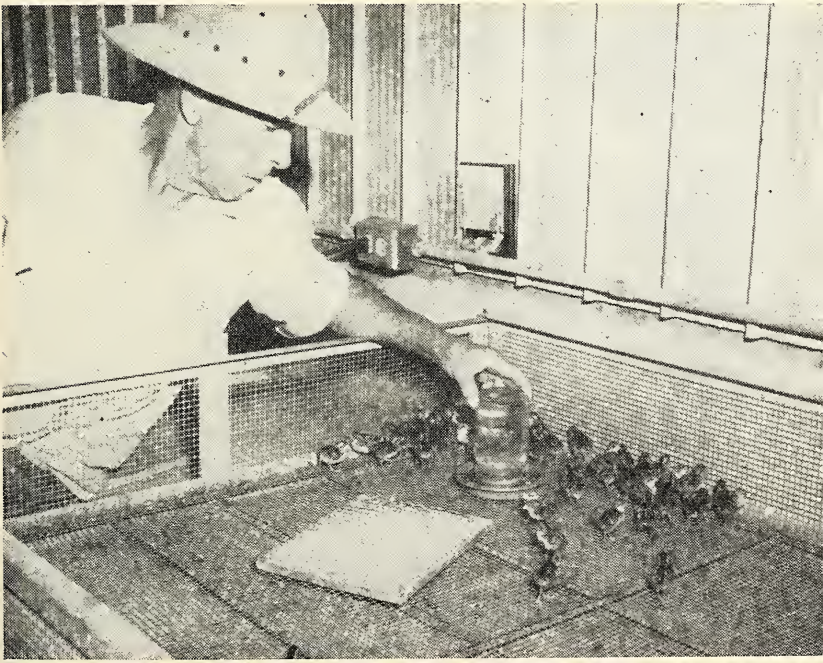
During the summer and fall of 1948, new cooperators were secured in such numbers that negotiations were carried on to purchase one million bicolor seedlings. Twenty-one parishes through the Agricultural Extension Service had requested planting material to establish 225 borders, at 1,000 seedlings per border. The Soil Conservation Service through 38 cooperating work units had requested some 835,000 seedlings, enough to plant 835 borders of like size. It was decided to cut this down to an even million plants, one thousand borders, and plans were secured accordingly and planting preparations begun.

The Seed Reproduction Plot at Minden was fenced during the year according to an agreement with the Soil Conservation Service. During this time fencing of the seed plots at Lake Bruin Fish Hatchery near St. Joseph was also commenced. These measures were necessary in order to exclude cattle from these sites.

The Soil Conservation Service held a Field Day or One Day Demonstration of renovating a farm near Shreveport and in cooperation with their technicians, eight field borders of lespedeza bicolor and serecia were planned for this event. This is to remain open for 5 years to enable those interested to inspect the results of complete conservation planning. Therefore, the site was considered an ideal location for demonsrtation field borders. These were planned and staked out with signs for the Field Day. Later the seedlings were furnished the Soil Conservation Service and transplanted by their technicians.

Due to the fact that it was physically impossible for one man to successfully carry out a program designed for two, the inspection of field borders and planning talks with individual farmers had to be omitted in many cases. This lack of technical supervision showed up in the failure in many cases of the proper maintenance practices by the farmer. In general, the borders protected, and maintained were successful, whereas those which received little or no attention beyond being put into the ground, failed to make proper growth and some were destroyed in cultivation, some by cattle, etc.

The first quarter in 1949 was devoted to securing and distribution planting material for field borders. The plan had been set up on the basis of one thousand borders of one thousand seedlings each, a total of one million bicolor seedlings. However, other states as well as Louisana had suffered from extremely dry weather. When word was finally received that the allotment was to be cut 75%, it necessitated a complete revision of plans and a considerable amount of personal contact work with the various cooperators in order to explain the exact situation and to make the necessary drastic reduction without causing suc antagonism as to endanger the future of the entire field borde program. In areas where there was no great demand for the plants it was possible to eliminate entire work units for the season and in others the amount was reduced to the require extent, cutting down from 1,000 borders to only 250. The furthe reduction to 20% which was made while enroute to Georgia t procure the seedlings, was met by reducing the number of plant per border from the standard 1,000 to the minimum of 800 This was necesary because it was absolutely impossible to reduc the number of borders to 200 without endangering the entir program. The fact that the bicolor seedlings were packed i sawdust that had to be kept wet, made it necessary that the be delivered first, and separate trips made later to distribut the serecia seed.



Baby quail in brooder in L.S.U. hatchery.

The Soil Conservation Service work units cooperating in planting field borders in 1949 and the number of bicolor seedlings used by each, was as follows:

Alexandria	9,600
Bastrop	1,600
Bernice	4,800
Calhoun	1,600
Clinton	2,400
Convent	4,000
Crowley	2,400
Denham Springs	1,600
DeRidder	4,000
Farmerville	14,400
Franklin	1,600
Franklinton	4,000
Gibsland	1,600
Homer	1,600
Jena	4,800
Kentwood	2,400
Mansfield	4,000
Many	1,600
Marksville	800
Minden	2,400
New Roads	800
Oak Grove	1,600
Opelousas	3,200
Rayville	4,000
Ringgold	4,800
Ruston	2,400
Shreveport	12,000
St. Francisville	4,000
St. Joseph	3,200
Tallulah	16,000
Thibodaux	800
Ville Platte	1,600
Winnfield	8,000
Winnsboro	4,000
Demonstration Farm	8,000
S. C. S. Totals	145,600

This season we started working with the Agricultural Extension Service and the cooperating parishes, many in connection with the 4-H Club Wildlife Projects. The cooperating parishes and amount of seedlings are as follows:

Beauregard	2,400
Bienville	1,600
Bossier	1,600
Caddo	4,000
Caldwell	800
Concordia	800
DeSoto	800
East Feliciana	5,600
Evangeline	800
Franklin	800
Grant	2,400
Iberville	3,200
Jefferson Davis	800
Natchitoches	4,800
Richland	2,400
Sabine	3,200
St. Helena	1,600
St. Landry	1,600
St. Tammany	1,600
Tangipahoa	2,400
Union	4,000
Vernon	4,800
Washington	2,400
Webster	2,400
Winn	800
	57,600

The Extension Service allotment of 57,600 plus the Soil Conservation Service total of 145,600 and 4,000 plants used in experimental and miscellaneous distribution completes the supply of seedlings secured from Georgia at a cost of $3.00 per thousand. Due to increased demand from other areas there was no available surplus at the Soil Conservation Service nursery at Minden. The serecia seed was delivered on time and 4,350 pounds delivered to the various cooperating agencies for use in conjunction with the bicolor seedlings in establishing combination field borders. This was more than sufficient for use with the limited number of seedlings furnished, but in many cases where bicolor was not available for planned borders, the serecia was put out in the expectation of being able to add the bicolor in 1950.

As the field border program in Louisiana had reached the stage where the main problem was not promotion but production, some time was spent in endeavoring to locate suitable sites for the establishment of a nursery to provide plants for the 1950 season. The Division of Fish and Game granted permission to use a small area available at the L. S. U. Quail Hatchery. Equipment belonging to the project were used in preparing the site. Personnel at the hatchery was very cooperative and assisted with the work. This area was planted in early June with a garden seeder and by hand. Mr. Rufous Walker, Superintendent of the Rice Experiment Station Farm at Crowley, permitted the Fish and Game Division to use some land where irrigation by flooding was possible. On this area, the work of preparing, planting, etc., was carried out by personnel of the Experiment Station. Some experiments with 2,4-d were carried on here and proved successful in destroying certain types of weeds and vines which were choking out the bicolor. In the plot at the L. S. U. Quail Hatchery, hand weeding was necessary.

One of the most important phases of the summer work was in connection with the newly hired Assistant Project Leader. Although his work was to be confined mainly to the western portion of the state and the proposed permanent nursery for growing lespedeza bicolor seedlings, it was considered advisable to familiarize him with the work throughout the entire state. The 25 Soil Conservation Service Districts operating through 44 work units cover the state with the exception of a few coastal parishes in the region of New Orleans. There is an Agricultural Extension Service office in each of the 64 parishes of the state and personal visitation is required to explain the work that the farm game habitat improvement project can do.

Considerable time was expended on the nursery program. The almost continuous rains and the lack of a reliable local labor supply presented serious obstacles in the instance of the plot established on the Quail Hatchery grounds. The high fertility of this piece of ground, together with the abundant rainfall caused vigorous growth of bicolor and weeds. The bicolor grew so rapidly that it reached the flowering stage and produced a light seed crop. The nursery plot established on the Rice Experiment State Farm at Crowley also suffered under adverse weather conditions; first a drought that necessitated its being flooded twice, and then the rainy season. However, the use of a light application of 2,4-d removed the overshadowing growth of vines and weeds and holds promise of being a very valuable practice in bicolor culture in Louisiana. The fact that both these plots were far removed from the domiciles of the project personnel was a further handicap. The permanent nursery site was located much more conveniently both in respect to supervisory personnel and a reliable local labor supply.

An information file on every lespedeza bicolor field border planting in the state was started but the pressure of work on the establishment of a new nursery prevented project personnel from making the necessary field inspections to complete this information. The addition of two biologists authorized in the Project Amendment will permit this work to be carried out. The field borders over the state were much more successful than the plantings made during the two previous seasons, partially due to the more abundant rainfall. Many of the plantings are averaging over seven feet in height in the first growing season and are bearing a heavy seed crop. These, of course, are the borders that were fertilized, cultivated, and protected from grazing stock. A few borders have been lost by being planted in areas that were not well drained. This condition was aggravated by the very wet season. In several instances no protection from cattle was given and these borders were grazed down to the ground. On one farm, borders located next to a swamp were heavily damaged by rabbits. Some damage from gophers was noted. This seemed much more extensive in the older plantings. In many cases the weather conditions or other reasons prevented proper care of the bicolor with the result that it was smothered in sod or weeds and did not make enough growth to produce seed. Many of these borders can be brought into production next season by proper fertilization and cultivation. On some of the larger plantations, a few borders were ploughed out by field hands who were not familiar with the plants.

The last quarter of the year was one of intense activity relating to the proposed expansion of the farm game habitat improvement program so that not only will the necessary technical assistance and supervision be available to the various Work Unit Conservationists of the Soil Conservation Service and the County Agents of the Agricultural Extension Service of the entire state, but arrangements were made which should make the state of Louisiana independent of outside sources for the lespedeza bicolor seedlings needed for planting field borders and food plots. It had been demonstrated that sufficient water at the proper time was an absolute necessity for raising bicolor seedlings, so it was necessary to plan some type of irrigation. After consideration it was decided that a sprinkler system of the portable type would best suit the requirements. Before the rather involved planning of the irrigation system could be undertaken, it was necessary to locate a site that would provide these essentials; a suitable soil type, an adequate and reliable water supply, and a dependable source of local labor for planting, cultivation, harvesting, etc. When the site was finally decided upon it was checked by State Soil Conservation Scientist and the Engineer of the Soil Conservation Service for suitability as to soil, water supply, and drainage. The S. C. S. mapped the area and the Engineer drew up plans and specifications for the irrigation system. All of this preliminary work had to be done before the project amendment could be written. The site selected was on public property under the control of the Police Jury of Beauregard Parish who was most cooperative and leased the area to the Department of Wildlife and Fisheries at no cost. Although only two ten acre plots will be used in actually growing the seedlings, some 90 acres were included in the lease to provide various facilities such as the wells and a pond of 1½ acres which will serve as a reservoir for water. Competent personnel were selected to be available for work as of February 1st, 1950. This allowed the tentative division of the state into 4 sections with the Project Leader handling one section as well as having supervision over the entire state. The Assistant Project Leader already working on this project would have one section of the state and direct supervision of the bicolor nursery.

Using the hand stripping method, sufficient seed was secured from the Seed Reproduction Plot at Minden to supply the planting needs of the nursery for the 1950 season.

The materials for fencing the nursery were secured and this work begun. The plots to be used were disced by the Assistant Project Leader and the area limed according to the recommendations of the Soil Conservation Service. An equipment shed is located on the area and provisions were made for it's repair. The necessary vehicles, implements, irrigation equipment, etc., have been provided for in the project amendments and will be secured during the first quarter of 1950.

In view of the fact that it was possible to secure an adequate amount of bicolor seedlings (one million), from the state of Georgia this year, it was decided not to lift the seedlings from the 4 acre planting at the Rice Experiment Station Farm at Crowley. This will be left as a Seed Reproduction plot. The location is one that can be flooded from a nearby rice irrigation canal and thus it should be able to produce a good seed supply even in those years when dry weather causes a seed crop failure in the northern part of the state, such as happened in the Minden reproduction plot in 1948.

After ascertaining that one million seedlings would be available from Georgia for the 1950 planting season, considerable time was spent in December, 1949, in confirming previous bicolor requests and contacting those who had not responded. The allocations for the following season were set up and cooperators notified as to the amounts that they would receive. It might be pertinent to note that 52 of the 64 parishes of the state are being included in the program for 1950. Of the 12 not included as yet, 9 are in the coastal marsh region where suitability of this type of planting has not been established.

The following planting and maintenance instructions were mimeographed and supplied to the cooperating agencies for distribution and planting material, and when followed should result in a very high percentage of successful bicolor field borders.

Land Development (Refuges)

Supervisor: Carroll J. Perkins

Project 12-D, Wildlife Management Preserve (Kisatchie Division, U. S. National Forest)

Leader: Clyde E. Harrison

Project 14-D, Deer Trapping and Transplanting

Leader: Flavil D. Hollis

Project 16-D, West Bay Game Refuge.
Manager: Ben R. Bass

Project 18-D, National Catahoula Wildlife Management Preserve
(Catahoula Division, U. S. National Forest)
Leader: Roland P. Vernon

Project 19-D, Evangeline Wildlife Management Area
(Evangeline Division, U. S. National Forest)
Leader: Francis J. D'Autremont

Project 20-D, Caldwell Parish Game Refuge No. 1
Manager: Welch Lively

Project 21-D, Livingston Parish Game Refuge
Manager: Bryan Smith

Project 22-D, Union Parish Game Refuge No. 1
Manager: C. B. Hollis

Introduction

Development work on the projects mentioned above has consisted of various phases of activity, namely: (1) Establishment of refuge areas, (2) Type mapping, (3) Game inventory, (4) Fence construction, (5) Placing boundary markers around refuge areas, (6) Plowing and planting of food and cover strips, (7) Trapping of predators from refuge areas, (8) Releasing of game for restocking purposes.

Refuges

Red Dirt Wildlife Management Preserve

This area contains 40,000 acres of cut-over longleaf pine land owned by the U. S. Forest Service. The area is enclosed by a hog-proof fence, with adequate cattle-gaps provided for road entrances. It is sufficiently marked along the boundaries and road entrances to plainly designate the area as a game preserve. It is located fifteen miles south of Natchitoches and is accessible by state highways. A memorandum of understanding with the U. S. Forest Service permits the state to utilize this area as a game preserve. The preserve had approximately 250 deer on the area prior to initiation of this project, February, 1948, and

Supervisor's residence—Red Dirt Wildlife Management Preserve.

the herd had a continuous increase since that date. A total of fifty-three semi-wild turkey were released on the area during the fall and winter of 1949.

Cover and food strip planting has been done on a major portion of the south half of the area which is protected from cattle by a four-strand barbed wire fence. All cattle found within the 40,000 acre enclosure were moved north of this dividing fence so as to make possible the growing of food and cover strips on the south half. Living quarters have been built on the area for project personnel. A tool shed has been provided to house tools and field equipment. Construction of a four mile power line has been provided to furnish necessary electrical power for the living quarters. To properly expedite project operations it was necessary to purchase motor vehicles, tractors, plows and tools. This equipment has been procureed and is now in operation.

West Bay Game Refuge

This area contains 18,380 acres of upland hardwood and pine forest land which has been acquired on a long term lease by the State without fee. This area affords an excellent range for upland game such as deer, turkey, squirrels and quail. The area is located five miles west of Oakdale and is accessible by state highway and county roads. Markers have been adequately placed around the entire boundary with more prominent signs placed at all road entrances. A game census made at the beginning of this project, May 1949, showed only a minimum stock of squirrels and quail. Since that date the area has been adequately stocked with deer, turkey, squirrels and quail. Excellent results have been realized from this restocking program. A constant vigil has been kept on this released game and at the time of this report trespassing and poaching have been kept to an absolute minimum. A predatory trapping program which has been in progress since the outset of this project has taken numerous predators from the area. Planting of supplementary food crops for deer, turkey and quail is now in progress and by the end of 1950 growing season these plantings should provide adequate food supply for all species of upland game now on the area. As the refuge is not bounded by a hog-proof fence it was necessary to fence all food plot plantings against range cattle and hogs. The progress of this refuge is highly satisfactory and valuable results are to be expected.

National Catahoula Wildlife Management Preserve

This area contains approximately 60,000 acres of upland hardwood and pine land and is owned by the U. S. Forest Service. It is located approximately ten miles south of Winnfield lying both in Grant and Winn Parishes. The state has acquired the use of this land for game management purposes through a memorandum of understanding with the U. S. Forest Service. The area is highly accessible by paved, gravel and dirt roads. Boundaries are well marked by signs and painted trees along an eight foot right-of-way and boundary roads. The area had been stocked with deer prior to the initiation of this project and at present a deer count showed approximately three-hundred deer on the preserve and adjacent areas. During the fall of 1949, twenty-one semi-wild turkeys were released on the area. The results from this release is proving satisfactory and in the course of breeding seasons these birds with proper protection will adequately re-stock the entire 60,000 acres.

During the open season of 1949, 114 legal deer were killed within one mile outside this refuge area.

A type map habitat survey and game census has been made of this refuge area.

Evangeline Wildlife Management Area

This area contains approximately 15,000 acres of upland pine and hardwood forest located five miles west and northwest of Forest Hill. The area is owned by the U. S. Forest Service and a memorandum of understanding has been entered into by the U. S. Forest Service and the state for its use as a wildlife management area. The area is enclosed by a hog-proof fence and is accessible by both state and parish roads. A game census showed the area to have a minimum stock of quail and squirrels. During the fall of 1949, thirty semi-wild turkeys were released on the area. Also fifteen deer were released within this enclosure February 3, 1950. A five mile hog-proof fence is to be constructed east to west across the area to exclude cattle and hogs from the southern portion which will be planted to food and cover strips.

Caldwell Parish Game Refuge No. 1

This area contains approximately 12,000 acres of upland and bottomland pine and hardwood forest. It is located fifteen miles southeast of Columbia and is accessible by state and parish roads. The use of this land was acquired by lease without fee on a long term basis. The area was officially declared a State Game Refuge October 25, 1949. Twenty-seven semi-wild turkeys were released on this area in the fall of 1949. Eighteen deer have been released on the area at the date of this report. A development program has been outlined for this refuge and work will begin in the spring of 1950.

The boundaries of this area have been adequately marked with signs. A right-of-way has been provided with line trees painted along the boundary where it is not bounded by state or parish roads.

Livingston Parish Game Refuge

This area contains approximately 10,000 acres of rolling upland and swampland with a pine-hardwood forest. The use of this land has been acquired by long term lease without fee.

Two views of the type of terrain encountered in certain parts of the Red Dirt National Wildlife Management Preserve.

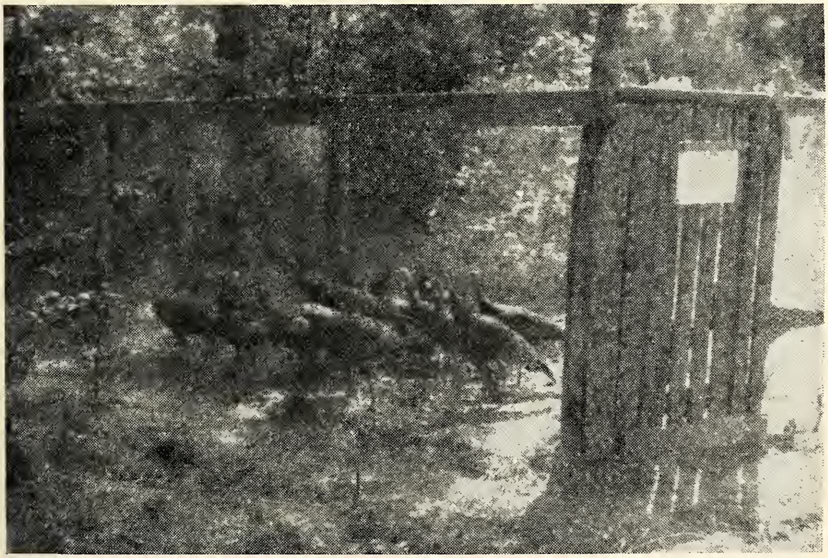
The area is accessible by state and parish roads and is located approximately five miles south of Springfield. Sufficient markers have been placed around the boundaries with all line trees painted. An eight foot right-of-way has been opened on portions of boundaries where not bounded by roads or streams. This right-of-way is well marked by signs and painted line trees.

The area was officially declared a State Game Refuge October 25, 1949. Twenty-four semi-wild turkeys and eleven deer have been released on the area during the fall and winter of 1949-50. These releases have proven to be highly satisfactory with trespassing and poaching held to the minimum.

This refuge has excellent game potentialities and with proper management will prove exceptional results.

Union Parish Game Refuge No. 1

This area contains approximately 9,000 acres of pine and hardwood hill land. The area affords a most excellent range for deer, turkey and squirrels. Land use rights were secured by long term lease without fee. It is bounded by state and parish roads on the west and is well marked by signs and painted trees.



Turkeys purchased for restocking are held in conditioning pens for 10 or 15 days before being released on open range. Such pens have been built on all refuges.

Wild turkey shipment from Pennsylvania to Louisiana. These turkeys were distributed on refuges in September 1949. Picture made at Baton Rouge.

An eight-foot right-of-way has been provided through timbered and brush areas where not bounded by roads. The east boundary denoted by Cane Creek which is also well marked. Turkey and deer management will be the major portion of work to be done on this area.

There were twenty-five semi-wild turkeys and fifteen deer released on the area during the fall and winter of 1949-50. A predatory control program has been initiated on the area with excellent results since the establishment of the refuge.

This area is located approximately ten miles north of Farmerville. Provisions have been made to place supplementary food plots on the area for both deer and turkey. These plots will be protected from livestock by a hog-proof fence.

Deer Trapping and Transplanting

This project was approved December 10, 1948 and has continued with various types of activities since that date. The purpose of the project is primarily confined to deer trapping and transplanting but it also has a major responsibility in securing potential game areas and setting them up as State Game Refuges.

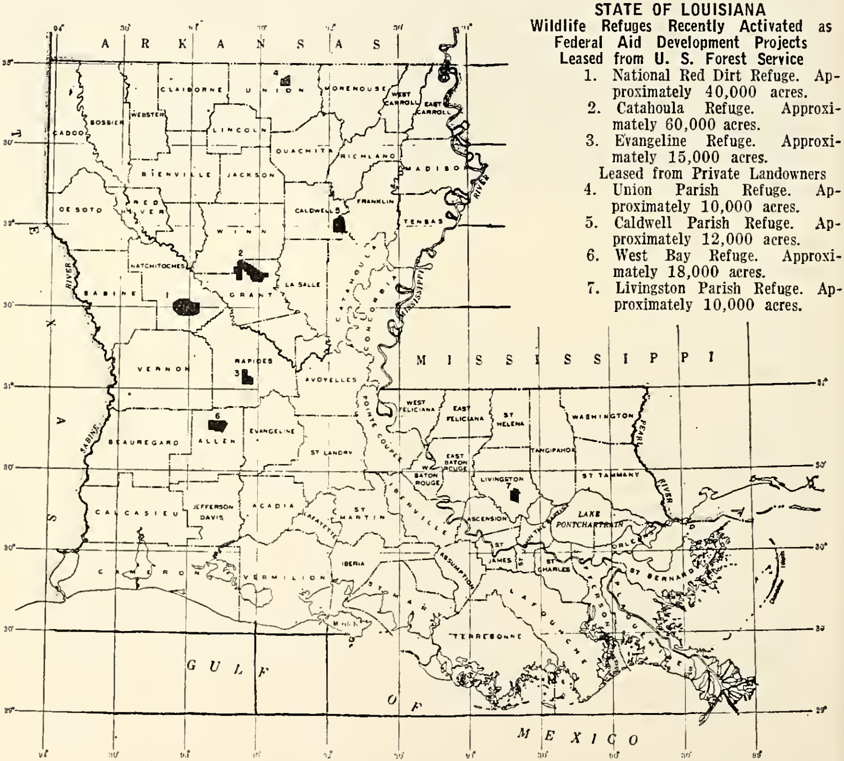
Hog traps of this type being used on the fenced portions of the refuge. It is necessary to exclude both cattle and hogs from areas when food and cover strip plantings are being made.

It is the purpose of this project to assign only four new game refuges per year to federal aid projects. However the number of refuges established per year may exceed this number. During the fiscal year of 1948-49 and 1949-50, the following State Game Refuges were set up: West Bay Game Refuge, Allen Parish, Caldwell Parish Game Refuge No. 1, Livingston Parish Game Refuge and Union Parish Game Refuge No. 1.

Deer trapping has been conducted on the following areas: A private park near Ruston, Lincoln Parish, a private park near Hammond, Tangipahoa Parish, Chicot State Park and Marsh Island State Refuge. During January and February 1949 thirty-three deer, fourteen bucks and nineteen does were trapped on the private park near Ruston. These deer were released in the following parishes: Caldwell 16, Beauregard 6, Allen 5, and Lincoln 3. Trapping operations were resumed in November, 1949 on Chicot State Park. Twenty-one deer were caught, twelve bucks and nine does. These deer were released on the West Bay Game Refuge. Trapping activities were moved to the private park near Hammond and Marsh Island in early December 1949.

At the date of this report February 1, 1950, ten deer, four bucks and six does were caught on the private park near Hammond, all were released on Livingsotn Parish Game Refuge. Eight deer, all does, have been caught on Marsh Island at the date of this report. These deer were released on Caldwell Parish Game Refuge No. 1.

Trapping operations will continue on Marsh Island through the remainder of their trapping season, future trapping on the Island will be governed by the degree of success obtained this year.



STATE OF LOUISIANA
Wildlife Refuges Recently Activated as Federal Aid Development Projects
Leased from U. S. Forest Service

1. National Red Dirt Refuge. Approximately 40,000 acres.
2. Catahoula Refuge. Approximately 60,000 acres.
3. Evangeline Refuge. Approximately 15,000 acres.

Leased from Private Landowners

4. Union Parish Refuge. Approximately 10,000 acres.
5. Caldwell Parish Refuge. Approximately 12,000 acres.
6. West Bay Refuge. Approximately 18,000 acres.
7. Livingston Parish Refuge. Approximately 10,000 acres.

Investigations and Surveys

Supervisor: Lyle S. St. Amant

Project 1-R, Publication
(Fur Resources Management Investigation)
Supervisor of Publication: Lyle S. St. Amant

Project 8-R, Statewide Wildlife Inventory and Management Plan
Leader: Lyle S. St. Amant

Project 15-R, Mourning Dove Study
Leader: John D. Newsom

Project 17-R, Migratory Waterfowl Investigation
Leader: Richard K. Yancey

Project 1-9, Publications

(Fur Resources Management Investigation)

This project carried out under the leadership of Mr. Ted O'Neil was completed in 1946. Later in 1948 it was reopened for publication under the supervision of the writer. During 1949 the final report was revised, edited and submitted for initial printing. The publication will be available to the public in book form in March 1950. It will include one cloth bound volume of 160 pages with 61 illustrations including 55 plates, 5 black and white maps and diagrams and 1 large colored vegetation type map of the Louisiana coast. The title of the book will be "The Muskrat in the Louisiana Coastal Marshes."

Project 8-R, Wildlife Inventory and Management Plan

Introduction

Project 8-R was initiated March 1, 1946; the field work on the project was completed in July, 1949. From that date until the present the project has been in the final report and publication phase. It is being prepared for publication along with several other projects by the writer and should be available to the public by the end of 1950 or early 1951.

In the second Biennial Report 1946-47 the results of about 39% of the field work was reported upon. In this present report the final results of some of the more important phases will be discussed but the more detailed and less important phases are being omitted because of the lack of space and time allotted for the preparation of this small part of the present biennial report.

The general perspective of the project encompasses the determination of the game resources of the state, the types and relative abundance of game and other pertinent information which will form a firm basis for a future long-range management program in Louisiana. The specific aim of the project is to inventory the game resources of the state and to evaluate the factors which influence game distribution and populations.

General Results of the Study

As the analysis of the field data becomes more and more complete a general picture of the history, the present status and the future potential of the game resources of Louisiana becomes more apparent. To appreciate fully and to understand completely the complex picture of game conditions in the state, however, certain terminology and game management facts should constantly be borne in mind. These are listed below with a brief explanation of each.

1. *The Carrying Capacity of the Land:* It is important to realize, in trying to understand our game conditions, that game, like corn or cotton, is a product of the land. This means that the quality and quantity of the land available for game are the basic controlling factors in game populations. Everyone knows that good land produces more corn or cotton to the acre than does poor land and in either case the more acres planted the more produce harvested. The same is true for game. For example: it takes one acre of the best type of range to produce or support one quail but in some cases our poorest range will produce or support only one quail on 20 or 30 acres. It also follows that 10,000 acres of one type range will produce or carry approximately twice as much as 5,000 acres of the same type range.

   Since this is true for all types of game it becomes obvious that the amount and quality (carrying capacity) of the various type game ranges in the State of Louisiana are the primary controlling factors in our game populations and if we ruin our range by poor land use practices our game populations will of necessity be reduced.

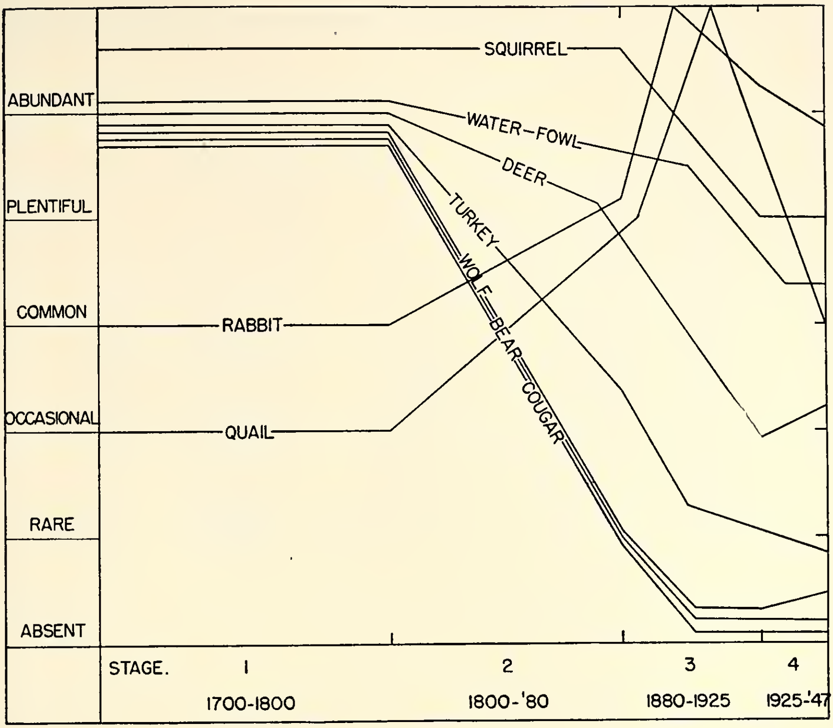
2. *Hunting Pressure and Its Effect on Game Populations:* Hunting pressure is the amount of hunting that occurs per unit area. For example, suppose we have 100 acres of good quail range with a maximum population of 100 birds each fall, 60 of which may be harvested without harm to next year's production. If only one man hunts this area he should find good hunting for five or six hunts and could kill on this single 100 acres 50% of his season limit. On the other hand, the hunting pressure could be increased to 10 or more men on the same 100 acres without hurting the productivity of the area but in this case the 60 harvestable birds would furnish six birds or only 5% of each hunter's season limit. If the number of hunters is increased still further or if more than the normal harvest is removed, the range becomes depleted of game because the breeding stock is removed. With this fact clearly in mind it becomes obvious that the total game range in the state is important and that even though in many instances parts of our range are producing well there is still not enough game to supply Louisiana's 200,000 hunters. In final analysis the bitter fact is that Louisiana is only so large and that even if every square foot of its range is made to produce to its maximum and if the number of hunters continue to increase it is evident that they must be satisfied with smaller bags each year even if the state is able to produce at the maximum rate.

3. *Limiting Factors:* A limiting factor is any practice, condition, or event, controlled or uncontrolled, that limits the productivity of a good range. In some instances limiting factors may be eliminated by good management practices which increases the game supply. In other instances a limiting factor cannot be removed so it must be borne with or a compromise brought about. Some of the factors reducing the productivity of our game ranges in Louisiana are as follows:

1. An increase in clean mechanized farming — the elimination of weed patches, fallow fields, thickets and the old type tangle along ditches and fences. This reduces both the food and cover on many of our farms and has cut the original game producing ability of the land to less than half.
2. New crops and mass production of single crops on specialized farms rather than the diversified nature of crops on general farms. This reduces the year-round food supply for game.
3. Increased cattle production and overgrazing. This practice eliminates much of the escape cover and food and forces most of the original population to leave.
4. Poor forestry conditions. Overcutting, loss of den trees, and a constant disurbance of the shyer types of game.
5. Uncontrolled fire.
6. A loss of upland game range from natural and artificial reforestation.
7. A lack of game food and cover on less fertile lands particularly in the cutover pine barrens.
8. Excess flooding in some areas; overdrainage in others.

With the above terms explained we may now turn to the general consideration of the past, present, and future game conditions of the State as has been determined by this study. Figures I, II and III illustrate graphically certain changes that have occurred in the game conditions of Louisiana, and the potential of our present range under good management.

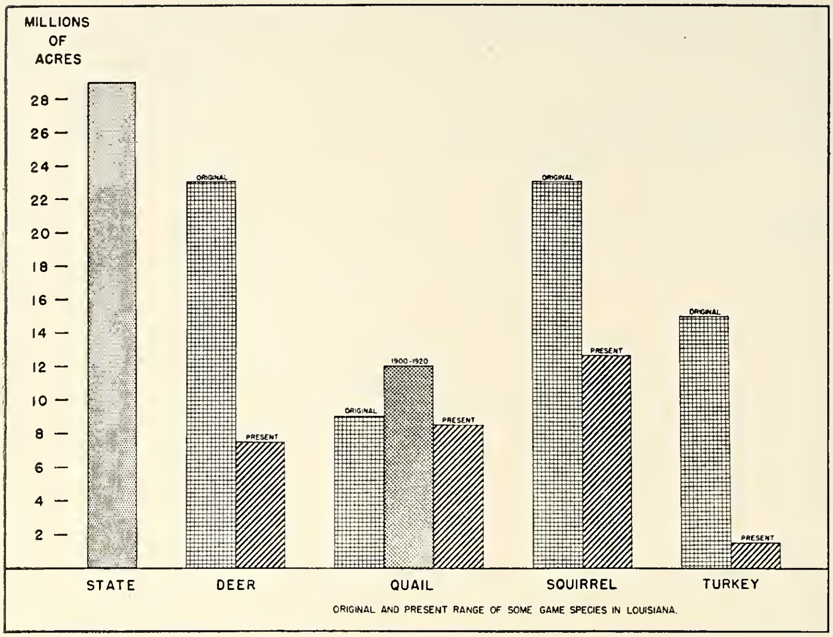
In Graph I is shown the general trend of changes in game populations since before the coming of white man until the present. Several facts are evident from a study of this chart. It is clear that farm game (quail and rabbits) was not as plentiful during early times as during the early part of the twentieth century when farming reached a peak in extent and diversity. The decrease during the past 25 years is due to clean farming, less diversification and greater hunting pressure. Large predator types of game (bear, cougar, and wolves) declined rapidly during



GRAPH I

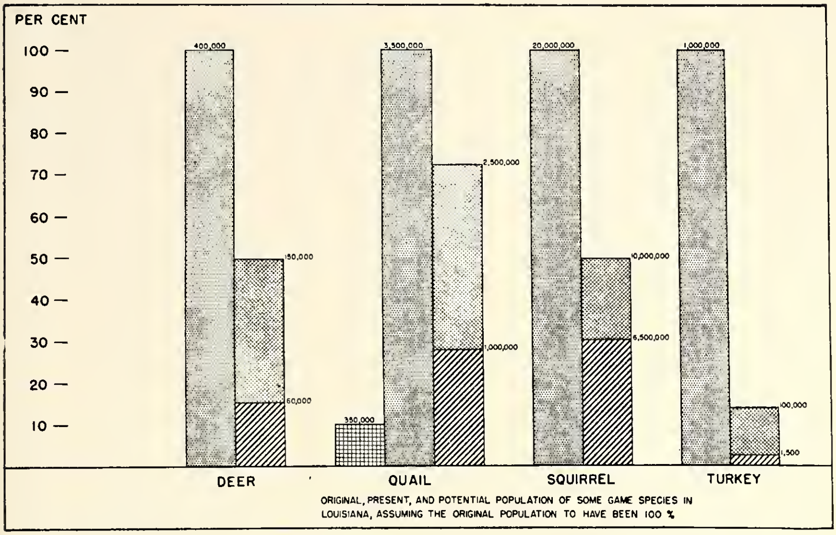
the 19th century because they were hunted as predators, for the market, and for fur. They all but disappeared from the state with the elimination of the virgin forest after 1880 because it left them with virtually no range. The remaining types (turkey, deer, waterfowl) that managed to survive the market and food hunting of the nineteenth century could not withstand the great loss of range caused by the clean cutting of our forest between 1880 and 1920 and the draining of many of our swamps and marshes. This loss of range coupled with ever increasing hunting pressure has resulted in a general decline of most game populations at the present time.

Graph I deals with relative abundance as best could be determined but Graphs II and III indicate in actual figures and percentages our past and present game ranges and past, present, and potential game populations.



GRAPH II

In Graphs II the column at the extreme left represents the 29,000,000 acres that makes up the State of Louisiana. The left hand column for each species of game represents the maximum range of that particular species in the original virgin wilderness while the column on the right represents the present range. The relative difference in height of the two columns for each species indicates the loss or gain in range. For example in early times approximately 23,000,000 of the 29,000,000 acres of the state was good deer range. At present because much of our forest has been cut only 7,500,000 acres remain. In the case of quail three columns are shown because the available range between 1900 and 1920 shortly after our timber was clean cut was greater than at any other time. The original virgin quail range though slightly greater than the present was made up of prairie land, natural meadows, burned areas, and the virgin long leaf pines areas all of which were very poor quail producers in comparison to farm lands and the freshly cut pine lands of more recent years. Squirrel, and turkey both suffered a loss of range with the cutting of our forest but turkey were much the harder hit because they require more mature and virgin stands of timber of which there is very little left in the state.



GRAPH III

Graph III shows the relative per cent of each type of game in the past and at present and at the future potential based on the amount of original range, the present range, and the carrying capacity for each species. For example in the case of the deer the original wilderness range of 23,000,000 acres is thought to have produced a maximum capacity of one deer to 50 to 60 acres for an estimated total population of approximately 400,000 for the entire state. This original population is set at 100% for the state (left column) because it is estimated as the maximum that could ever be produced under any condition. At present the total deer population for the state is 60,000 or about 15% of the original population (lower part of right column). The present available deer range in the state is 7,500,000 acres (see Graph II), this should produce under good management at least 150,000 to 200,000 deer. This potential population is represented in the extension of the right hand column. In the case of quail the maximum population 3,500,000 was not reached until 1910-1925 therefore the center column represents 100% production. The left column indicates the original virgin population and

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the right column illustrates the present and potential quail population of the state under good management. Squirrel and turkey should be read the same as deer with the left column indicating 100% production and the right the present and potential population.

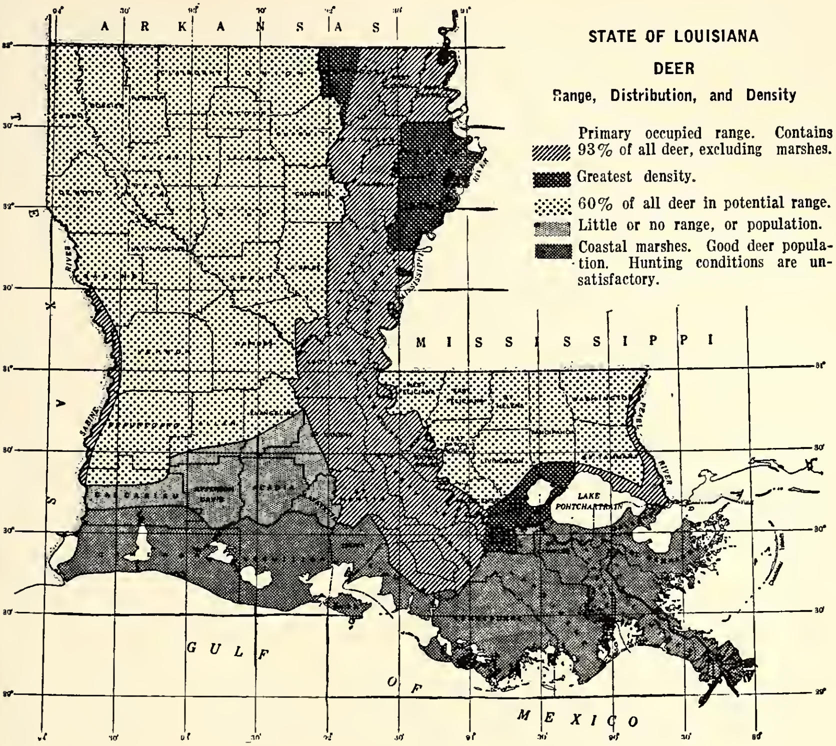
It is clearly seen in Graphs I, II and III that our game populations have declined, and our game ranges have been greatly decreased in the past 150 years. Little can be done to increase the amount of range in Louisiana but the existing range can be made to produce considerably more than it does at present as is indicated by the estimated potential increases shown in Chart III. To bring about these increases in population on our existing ranges two things must be done. (1) Our good quality range with a high carrying capacity should be managed carefully to see that the maximum production is reached. (2) The poorer ranges should be developed and the carrying capacity of them raised by the planting of food and cover and the removal or neutralization of as many limiting factors as possible. Following is a detailed discussion of some of our most important game types that should clearly show the present status, some of the causes for the current condition, and the increase that can be expected if sound game management practices are applied to the existing and potential range. Each species will be discussed separately.

Deer

Population and Annual Kill: At the time this deer inventory was completed there were approximately 40,000 deer in Louisiana, excluding the coastal marshes. This figuring was determined by a parish by parish inventory of all the upland areas. (See Tables I, II, and III for a summary of the complete inventory). The study did not include a detailed inventory of deer in the marsh parishes but careful estimates indicate between 15,000 and 25,000 more deer populate this area. The total deer population of the State at this time, therefore, is between 60,000 and 70,000. This ranks Louisiana among the first of the Southeastern States in deer population.

The annual kill of deer in Louisiana probably averages 10% of the total population in the upland areas but is probably much less than this in the inaccessible and little hunted marsh areas.

An actual check of our heaviest hunted areas indicated 3,503 kill from a population of 39,928. (See Table I)


ARKANSAS
STATE OF LOUISIANA
DEER
Range, Distribution, and Density
Primary occupied range. Contains 93% of all deer, excluding marshes.
Greatest density.
60% of all deer in potential range.
Little or no range, or population.
Coastal marshes. Good deer population. Hunting conditions are unsatisfactory.
MISSISSIPPI
MISSISSIPPI RIVER
SABINE RIVER
PEARL RIVER
LAKE PONTCHARTRAIN
TEXAS
GULF OF MEXICO

Range and Distribution of Population: There are approximately 7,500,000 acres of occupied and potential but unoccupied deer range in the state excluding the marsh. (See Table I, II, and III: Map 1) The 25,000 deer populating our marsh are scattered over 4,000,000 acres and for most practical purposes cannot be hunted or managed. For this reason the remainder of the discussion will deal primarily with the 40,000 upland deer distributed over the 7,500,000 acres of upland range. This area has a much greater deer potential than it is carrying at present, as will be brought out in the following discussion.

As the analysis of the deer population and distribution proceeds a number of important facts come to light which should serve as a key to the management of the deer in the uplands of

TABLE I—DEER INVENTORY DATA—UPLAND PARISHES AND MISSISSIPPI—ATCHAFALAYA RIVER FLOOD PLAIN

Parish	Type and Size of Occupied Range		Type and Size of Unoccupied Potential Range						
	Swamp and Bottom Land Hardwoods	Pine-Hardwoods and Upland Hardwoods	Swamp and Bottom Land Hardwoods	Pine-Hardwoods and Upland Hardwoods	Estimated Present Population	Avg. Pop. Density Occupied Range	Average Annual Kill	Estimated Potential Population	Remarks
Allen	50,000‡	......‡	25,000‡	25,000‡	50	1,000§	Season Closed	2,000	
Ascension*†	37,120	......	10,000	......	1,480	25	140	1,700	
Assumption*	114,000	......	......	......	570	200	55	2,280	
Avoyelles*	259,000	......	......	......	1,295	200	100	5,180	
Beauregard	49,000	25,000	......	......	150	493	12	1,400	
Bienville	20,000	......	......	50,000	25	800	Season Closed	1,000	No extensive range
Bossier	......	25,000	125,000	130,000	10	2,500	Season Closed	5,600	
Caddo	28,000	15,000	53,000	30,000	45	955	Season Closed	1,200	Range too scattered
Caldwell	12,800	60,000	57,200	122,000	120	606	Season Closed	5,000	
Catahoula*	75,000	150,000	......	......	300	7,500	20	4,500	
Claiborne	22,000	......	15,000	......	14	1,571	Season Closed	750	Range too scattered
Concordia*	300,000	......	......	......	6,000	50	500	6,000	
DeSoto	20,000	......	30,000	......	20	1,000	Season Closed	1,000	
E. Baton Rouge*	......	......	16,000	......	....	....	...	300	No extensive range
E. Carroll*	81,000	......	......	......	800	101	75	1,600	
E. Feliciana	......	......	25,000	......	....	....	Season Closed	500	No extensive range
Franklin*	45,000	......	25,000	......	400	112	35	1,400	
Grant	8,000	20,000	80,000	210,000	350	80	40	3,180	Poor quality range
Iberville*	244,000	......	......	......	1,220	200	140	4,880	
Jackson	90,000	150,000	......	......	200	1,200	Season Closed	4,800	
Lafourche*	151,000	......	......	......	755	200	75	3,020	
LaSalle	50,000	80,000	......	70,000	66	1,969	6	2,000	Poor quality range
Lincoln	20,000	......	......	......	110	181	Season Closed	400	Range too scattered
Livingston*†	32,000	......	112,000	185,000	1,000	32	100	6,500	
Madison*†	200,000	......	50,000	......	5,000	40	350	6,000	
Morehouse*†	239,000	......	......	......	1,150	207	35	4,700	
Natchitoches	20,000	40,000	160,000	55,000	200	300	...	5,500	
Ouachita	16,000	......	135,000	......	40	400	Season Closed	3,000	
Pointe Coupee	172,000	......	......	......	860	200	80	3,440	

TABLE I—DEER INVENTORY DATA—UPLAND PARISHES AND MISSISSIPPI—ATCHAFALAYA RIVER FLOOD PLAIN—Continued

Parish	Type and Size of Occupied Range		Type and Size of Unoccupied Potential Range						
	Swamp and Bottom Land Hardwoods	Pine-Hardwoods and Upland Hardwoods	Swamp and Bottom Land Hardwoods	Pine-Hardwoods and Upland Hardwoods	Estimated Present Population	Avg. Pop. Density Occupied Range	Average Annual Kill	Estimated Potential Population	Remarks
Rapides	40,000	......	190,000	88,900	100	400	Season Closed	6,000	
Red River	......	18,000	17,000	......	15	1,200	Season Closed	700	
Richland*	50,000	......	......	......	35	1,428	Season Closed	1,000	
Sabine	25,000	......	75,000	120,000	25	1,000	Season Closed	4,400	
St. Helena	10,000	......	25,000	20,000	10	1,000	...	1,100	
St. James*†	100,000	......	......	......	3,000	33	300	4,000	
St. Landry*	255,000	......	......	......	1,275	200	120	5,100	
St. Martin*	317,000	......	......	......	1,585	200	150	6,340	
St. Mary*	52,000	......	......	......	260	200	20	1,040	
St. Tammany ...	105,000	......	......	......	150	700	23	2,000	
Tangipahoa*† ..	48,000	......	10,000	30,000	1,500	32	150	3,000	
Tensas*†	271,000	......	......	......	9,000	30	900	10,000	
Union	58,000	......	121,000	121,000	150	386	15	6,000	
Vernon	54,000	......	46,000	......	150	360	12	2,000	
Washington	25,000	......	23,040	55,040	25	1,000	Season Closed	2,000	
Webster	......	......	25,000	......	3	....	Season Closed	500	Range too scattered
W. Baton Rouge*	50,000	......	......	......	150	330	25	1,000	
W. Carroll*	86,000	......	......	......	15	5,733	Season Closed	1,700	
W. Feliciana	......	......	40,000	......	....	....	Season Closed	1,000	
Winn	6,000	14,000	140,000	335,000	250	80	25	5,000	Poor quality range
Total	3,906,920	597,000	1,630,240	1,646,940	39,928	113.	3,503	152,710	

† Parishes which have a State or Private Refuge or which lie adjacent to parishes with refuge

* Parishes with large acreage of bottom land hardwood range

‡ All figures represent acres

§ Density figures indicate acres per deer

TABLE II—DEER INVENTORY DATA—PRAIRIE LAND (RICE AREAS)

	Type and Size of Occupied Range		Type and Size of Unoccupied Potential Range					
Parish	Swamp and Bottom Land Hardwoods	Pine-Hardwoods and Upland Hardwoods	Swamp and Bottom Land Hardwoods	Pine-Hardwoods and Upland Hardwoods	Estimated Present Population	Avg. Pop. Density Occupied Range	Average Annual Kill	Estimated Potential Population
Acadia	None	None	45,000	None	None	None	None	900
Evangeline	None	None	30,000	None	None	None	None	600
Jefferson Davis	None	None	13,000	None	None	None	None	260
Lafayette	None	None	20,000	None	None	None	None	400
Vermilion	None	None	40,000	None	None	None	None	800
			148,000					2,960

TABLE III—DEER INVENTORY COASTAL MARSH

Parish	Type and Size of Occupied Range		Type and Size of Unoccupied Potential Range					
	Swamp and Bottom Land Hardwoods	Marsh Lands	Swamp and Bottom Land Hardwoods	Marsh Lands	Estimated Percent Population	Avg. Pop. Density Occupied Range	Average Annual Kill	Estimated Potential Population
Cameron	1,000	812,410	......	......	1,000			
Calcasieu	50,000	190,000	......	......	......			
Iberia	130,000	128,000	......	......	2,500			
Jefferson	38,000	200,000	......	......	1,500			
Lafourche	*	449,000	......	......	4,000			
Orleans	6,000	117,000	......	......	800	(This information not yet determined for coastal marshes)		
Plaquemines	7,000	590,000	......	......	1,000			
St. Bernard	24,000	290,000	......	......	1,000			
St. Charles	69,000	100,000	......	......	......			
St. John	100,000	15,000	......	......	......			
St. Martin	*	45,000	......	......	......			
St. Mary	*	234,000	......	......	7,000			
Terrebonne	96,000	740,000	......	......	5,000			
Vermilion	44,000	424,593	......	......	1,500			
Total	565,000	4,435,003	......	......	25,300			

* Hardwood Sections of these Parishes listed elsewhere (See Table II)

Louisiana. In the first place the present upland deer population is primarily confined to the bottom land and swamp areas of the state. (See principal occupied deer range, Map 1). In this bottom land area consisting of all or parts of only 26 of our 64 parishes the deer range and population is distributed as follows:

Occupied Range	3,208,120 Acres
Unoccupied Range	270,000 Acres
Total Range	3,478,120 Acres
Total Population	37,485 (93.7% of all deer in upland of State)
Density	1 deer in 85.5 Acres

It is clear that although the occupied range in this area consists of only half of the total upland range of the state it carries 93.7% of all the deer outside the marsh. A still closer examination of this area indicates that within it there are areas with much higher deer populations than others. For example there are 22,130 deer or 59% of all the State's upland deer population occupying only 927,000 acres of range in all or parts of 7 parishes within the primary deer area (see map area of greatest concentration).

On the other hand over half of the State's deer range is either unoccupied or very sparsely occupied by deer. Map 1 indicates that most of this area is in the pine and pine-hardwood areas of the northwestern and central parts of the State. A summary of conditions on this potential area is as follows:

Range very sparsely occupied or recently restocked	1,037,315 acres
Potential range—unoccupied	3,044,980 acres
Total undeveloped range in state	4,082,295 acres
Total population	1,773—2,000 deer
Density	1 deer in 585 acres

The above figures along with the areas on the map should be compared with the figures and location of the primary occupied range in Louisiana. (See tables, maps above).

A study of the deer map indicates two other areas of the State not yet discussed. One is represented by all or parts of 6 parishes making up the prairie land (rice area) of the State. This small area unfortunately is not suitable deer range. It contains only 148,000 acres of wooded areas that might be used for deer but these are distributed so poorly that only a few hundred deer could be expected to survive in the area if they managed to remain at all. The remaining marsh areas consist of approximately 4,500,000 acres which has a deer population but poor hunting and deer managing characteristics. A detailed study of this area has not been carried out to date but Table IV shows the distribution of range and estimated populations. Potential increases in population are questionable.

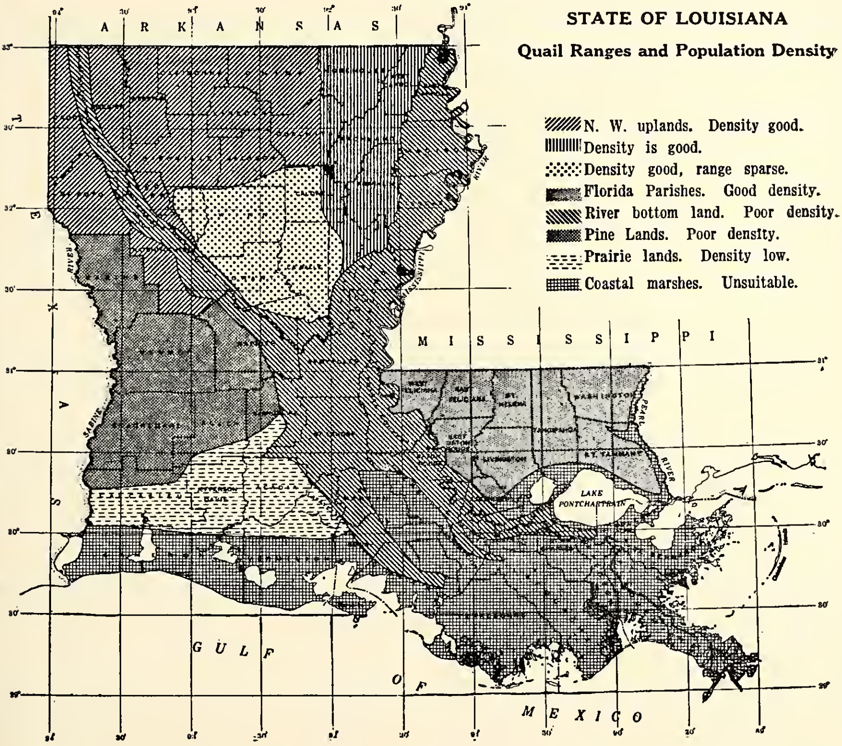
The Deer Potential of Louisiana: Although the above discussion indicates that Louisiana has a good deer supply in relation to other Southeastern States it is not producing nearly the deer that it could and should. Some of the reasons for this poor production may be brought to light by a careful examination of the data discussed above. The first and most obvious fact is that practically all of our deer in the upland are carried on less than half of the State's range and furthermore that nearly 60% of the total population is concentrated in a small part of this occupied range. To understand fully the cause of this peculiar distribution of deer the changes in land use in the State must be reviewed for the past 50 years. Before the virgin timber of the State was cut between 1880 and 1920 deer were scattered over this entire area. As our pine lands and bottom lands were cut clean and burned the range of the State was reduced by more than half. This coupled with unrelentless hunting and chasing by dogs decimated the deer in the pine-hardwood areas and all but eliminated them in the swamps. Some deer were able to survive in our deeper more inaccessible swamps because they could escape from man and dogs. From this stock our deer herds of the swamp and bottom lands have been able partially to re-establish themselves but the deer have not been able to re-enter the reforested pine lands because of such relatively open woods they cannot escape from dogs and either they are easily killed or run back into the tangles of the swamp. Even in our swamp areas, refuges and areas of protection have more than proved their worth. There is ample evidence for this in the fact that 60% of the deer are concentrated in seven parishes on 927,000 acres that have some types of refuge or protective system. In these protected areas the population density is more than three times greater than in the uprotected parts of the swamp and bottom land area and to those who fear refuges will curtail hunting a study of Table 1 will indicate that more than three times as many deer are killed in the parishes with refuges than in those without protection. It is clear from the above above discussion that the only portions of the deer range in the State producing anywhere near their maximum are the areas where some type of protection has been offered the deer from illegal hunting, running by dogs the year round, and a chance to escape and rest during the hunting season. There is no reason why a vast deer herd cannot be developed in the state if the principle of protection and management is applied to our entire potential range. If the remainder of the State can be made to produce as our best areas are producing we could eventually expect a deer population of 150,000 with an annual kill of 15,000 or more—an increase of more than 300% when compared with the present condition. (See Table I for this estimated increase in population by parishes).

To bring about this increase in deer population the following steps should be taken. (Many of these are now in the process of being made. A full discussion of the progress in management is considered elsewhere in this biennial report.)

1. Establishment of permanent refuges both in the bottom land and pine-hardwood sections of the State.
2. Protection of existing herds from illegal kills. This could be greatly aided by a tag system of enumerating the total legal deer kill.
3. Restock and close the season in areas that have few or no deer until the herds reach a harvestable surplus.
5. Develop a system of greater regulatory control of the annual kill so that the harvest of surplus deer may be carefully managed.
5. Maintain an annual check or diseases and food conditions to prevent wholesale losses from epidemics or starvation which will certainly occur as the herds become excessive.

Quail

The quail situation in Louisiana is much more critical than that of deer. Where deer are increasing slowly and with a small amount of help in the way of management could be made to increase rapidly; quail are on the decline and will need a great deal more management to show even the slightest tangible result. The primary reason for this decline is that quail are associated with farm land and cattle ranges both of which have been brought under much different usage during the past 30 years. The newer methods of farming and the great increase in cattle production plus a natural deterioration of some of our quail ranges has resulted in a general land use pattern, perhaps financially sound for the land owner, but greatly detrimental to farm and upland game, particularly quail.


STATE OF LOUISIANA
Quail Ranges and Population Density
▨ N. W. uplands. Density good.
▥ Density is good.
░ Density good, range sparse.
▦ Florida Parishes. Good density.
▧ River bottom land. Poor density.
■ Pine Lands. Poor density.
▤ Prairie lands. Density low.
▦ Coastal marshes. Unsuitable.
ARKANSAS
MISSISSIPPI
TEXAS
GULF OF MEXICO
MISSISSIPPI RIVER
SABINE RIVER
PEARL RIVER
WEST FELICIANA
EAST FELICIANA
ST. HELENA
WASHINGTON
TANGIPAHOA
ST. TAMMANY
LIVINGSTON
EAST BATON ROUGE
LAKE PONTCHARTRAIN

At the time of the quail inventory there were approximately 1,000,000 quail in Louisiana occupying 8,900,000 acres of range. A figure on quail population may mean little more than index to actual condition because the high breeding potential (14 offspring per pair per year) of this species and its great sensitivity to good or bad breeding conditions, food conditions, weather,

Table IV QUAIL INVENTORY DATA—NORTHWESTERN LOUISIANA UPLANDS

Parish	Total Area	Approximate Quail Range		Per Cent of Parish in Quail Range	Pop. Density on Range	Acres per Covey on Range	Pop. Density in Total Parish	Acres per Covey in Total Parish	Total Coveys in Parish	Total Birds
		Farms and Associated Lands	Cut-Over Pine Woods							
Bienville	528,640*	114,686*	63,952	33.7%	0.181‡	66.2‡	0.062‡	177†	2,976	35,712‡
Bossier	538,240	193,628	14,704	38.7%	0.174	69	0.062	178	3,030	36,360
Caddo	576,000	289,152	21,462	53.9%	0.110	109	0.059	201.4	2,860	34,320
Claiborne	490,240	285,000	10,000	60.1%	0.200	60	0.116	103	4,750	57,000
DeSoto	575,360	244,405	......	43.5%	0.154	78	0.065	184	3,125	37,500
Jackson	373,120	106,941	6,310	30.3%	0.225	54	0.067	177	2,104	25,248
Lincoln	300,160	220,486	......	73.4%	0.225	54	0.162	74	4,083	48,996
Natchitoches	830,080	212,067	81,000	35.3%	0.107	112	0.038	316	2,626	31,512
Ouachita (West ⅔)	260,880	132,000	......	50.6%	0.225	55	0.111	108	2,400	28,800
Red River	264,320	169,760	7,940	67.2%	0.143	84	0.096	125	2,116	25,392
Union	579,840	257,265	......	44.3%	0.200	60	0.100	120	4,288	51,456
Webster	400,640	185,826	4,076	47.3%	0.189	63.3	0.090	133	3,000	36,000
TOTAL	5,717,520	2,411,416	209,444	45.8%	0.171	70.1	0.078	153	37,358	448,296

* All figures in these columns represent acres
† Population density in acres per covey
‡ Population density in birds per acre
§ Based on 12 birds per covey

Table V QUAIL INVENTORY DATA—CENTRAL LOUISIANA UPLANDS

Parish	Total Area	Approximate Quail Range		Per Cent of Parish in Quail Range	Pop. Density on Range	Acres per Covey on Range	Pop. Density in Total Parish	Acres per Covey in Total Parish	Total Coveys in Parish	Total Birds
		Farms and Associated Lands	Cut-Over Pine Woods							
Caldwell (West ⅔)	207,000	25,000	......	12.0%	0.400	30.0	0.048	248	833	9,996
Grant	428,800	90,000	50,000	32.6%	0.126	95.0	0.041	294	1,458	17,496
LaSalle	408,320	20,000	29,000	12.0%	0.087	138.0	0.010	1,150	355	4,260
Winn	608,000	88,825	21,740	18.1%	0.205	58.4	0.038	320	1,900	22,800
TOTAL	1,652,120	223,825	100,740	19.6%	0.168	71.3	0.033	357	4,546	54,552

Table VI QUAIL INVENTORY DATA—ARKANSAS ALLUVIAL UPLAND

(Mason Ridge Area)

Parish	Total Area	Approximate Quail Range: Farms and Associated Lands	Approximate Quail Range: Cut-Over Pine Woods	Per Cent of Parish in Quail Range	Pop. Density on Range	Acres per Covey on Range	Pop. Density in Total Parish	Acres per Covey in Total Parish	Total Coveys in Parish	Total Birds
Caldwell (East ⅓)	140,000	21,000	......	15.0%	0.187	64	0.028	427	328	3,936
Franklin	414,720	159,000	77,294	56.9%	0.185	65	0.101	118	3,509	42,108
Morehouse	514,560	200,000	......	38.8%	0.160	75	0.062	193	2,666	31,992
Ouachita (East ⅓)	150,000	25,000	......	16.6%	0.160	75	0.026	450	333	3,996
Richland	368,640	160,000	102,000	71.0%	0.153	78	0.108	111	3,318	39,816
W. Carroll	227,840	111,000	40,000	66.2%	0.185	65	0.111	98	2,323	27,876
TOTAL	1,815,760	676,000	219,294	49.3%	0.167	71.75	0.082	145	12,477	149,724

Table VII QUAIL INVENTORY DATA—FLORIDA PARISHES

Parish	Total Area	Approximate Quail Range: Farms and Associated Lands	Approximate Quail Range: Cut-Over Pine Woods	Per Cent of Parish in Quail Range	Pop. Density on Range	Acres per Covey on Range	Pop. Density in Total Parish	Acres per Covey in Total Parish	Total Coveys in Parish	Total Birds
Ascension (North ½)	84,453*	50,000*	......	59.2%	0.185‡	65†	0.110‡	109†	769	9,228§
E. Baton Rouge	295,680	102,000	......	34.4%	0.200	60	0.069	174	1,700	20,400
E. Feliciana	290,560	182,400	......	62.7%	0.250	48	0.157	76	3,800	45,600
Livingston	425,600	83,000	......	19.5%	0.250	48	0.048	246	1,730	20,750
St. Helena	268,800	110,479	10,000	44.8%	0.225	54	0.100	120	2,223	26,672
St. Tammany	581,120	109,637	210,000	55.0%	0.100	120	0.055	218	2,664	31,964
Tangipahoa	513,920	189,621	161,704	68.3%	0.166	72	0.113	106	4,860	58,320
Washington	425,600	216,728	37,000	59.6%	0.244	49	0.144	83	5,150	61,800
West Feliciana	262,400	134,000	......	51.0%	0.147	81	0.075	159	1,641	19,698
TOTAL	3,148,133	1,177,865	418,704	50.7%	0.185	65	0.094	128	24,537	294,444

* All figures in these columns represent acres
† Population density in acres per covey
‡ Population density in birds per acre
§ Based on 12 birds per covey

Table VIII QUAIL INVENTORY DATA—MISSISSIPPI AND ATCHAFALAYA BOTTOMLANDS

Parish	Total Area	Approximate Quail Range		Per Cent of Parish in Quail Range	Pop. Density on Range	Acres per Covey on Range	Pop. Density in Total Parish	Acres per Covey in Total Parish	Total Coveys in Parish	Total Birds
		Farms and Associated Lands	Cut-Over Pine Woods							
Ascension (Lower ½) .	107,547*	45,000*	None	41.8%	0.096‡	125†	0.040‡	298†	360	4,320§
Avoyelles	528,640	160,000	"	30.2%	0.100	120	0.030	397	1,333	15,996
Catahoula	468,480	80,000	"	17.0%	0.104	115	0.017	674	695	8,340
Concordia	453,760	68,000	"	14.9%	0.104	115	0.015	766	592	7,104
E. Carroll	276,480	85,000	"	31.1%	0.182	67	0.055	218	1,268	15,216
Evangeline (East ⅔) ..	303,360	135,000	"	44.5%	0.190	63	0.085	142	2,142	25,704
Iberville	391,040	85,000	"	21.7%	0.092	130	0.020	598	654	7,848
Madison	423,680	84,000	"	19.8%	0.142	84	0.027	429	1,014	12,168
Pointe Coupee	360,960	140,000	"	38.7%	0.096	125	0.037	322	1,120	13,440
Rapides (East ½) ..	389,760	132,800	"	34.0%	0.094	127	0.032	371	1,045	12,540
St. James	159,360	45,000	"	28.2%	0.092	131	0.028	465	343	4,126
St. John	144,000	24,000	"	16.6%	0.092	130	0.015	778	185	2,220
St. Landry ...	595,200	250,000	"	42.0%	0.120	100	0.050	238	2,500	30,000
St. Martin ...	472,320	108,000	"	22.8%	0.096	125	0.022	547	864	10,368
Tensas	398,720	85,000	"	21.0%	0.137	. 87	0.029	405	984	11,808
W. Baton Rouge	128,640	45,000	"	34.9%	0.125	96	0.043	277	468	5,616
TOTAL	5,601,947	1,571,800	None	28.06%	0.119	100.9	0.033	359.8	15,567	186,804

* All figures in these columns represent acres

† Population density in acres per covey

‡ Population density in birds per acre

§ Based on 12 birds per covey

Table IX

QUAIL INVENTORY DATA—SOUTHWEST PINE LANDS

Parish	Total Area	Approximate Quail Range		Per Cent of Parish in Quail Range	Pop. Density on Range	Acres per Covey on Range	Pop. Density in Total Parish	Acres per Covey in Total Parish	Total Coveys in Parish	Total Birds
		Farms and Associated Lands	Cut-Over Pine Woods							
Allen	496,000*	93,000*	201,560	59.3%	0.040‡	300†	0.023‡	505†	981	11,722§
Beauregard	757,760	130,000	414,475	71.8%	0.040	300	0.028	418	1,814	21,732
Evangeline (N. West ⅓)	126,720	25,000	54,000	62.3%	0.040	300	0.024	481	263	3,156
Rapides (West ½)	460,800	100,000	222,660	70.0%	0.040	300	0.028	428	1,075	12,900
Sabine	658,560	146,000	95,000	36.5%	0.040	300	0.014	820	803	9,636
Vernon	870,400	100,000	376,307	54.7%	0.040	300	0.023	548	1,587	19,044
TOTAL	3,370,240	594,000	1,394,002	59.0%	0.040	300	0.023	517	6,524	78,276

* All figures in these columns represent acres
† Population density in acres per covey
‡ Population density in birds per acre
§ Based on 12 birds per covey

etc., may cause a normal annual fluctuation of as much as 30% of the total population. This means that low quail populations can be succeeded in short order by good populations and vice versa according to the changing conditions.

On the other hand, continued permanent changes in land use can result in a permanent lowering of population if by such practices the carrying capacity of the range is continually reduced. This has been happening over all of the Southeastern states and Louisiana's quail populations have in particular been hard hit by changes in the land use pattern.

At the present time the quail range and population in Louisiana are listed in Tables IV, V, VI, VII, VIII, IX but may be summarized as follows:

Range on Farms and Associated Lands	6,660,000 acres
Range on Clear Cut Pine Lands	2,300,000 acres
Total Range	8,900,000 acres
Total Population on Range	1,000,000
Average Density on Range	1 quail per 8.9 acres
Average Density Entire State	1 quail per 29 acres

The figures listed above represent very little change in the amount of available quail range during the past 30 years but the size of the present population does reflect a 60% to 70% drop in the total quail of the State. The causes of this decline in quail population have been manifold but the primary reason seems to have been a great decrease in the ability of the range itself to support the bird populations that it once did. These changes are reflected in changes in land utilization, farming methods, erosion and lowered fertility of the land. Both the latter are natural changes to be expected after the clear cutting of long leaf pine lands. In addition to this gradual failure of the available range to produce or support as many birds as it did in former years, we must add increased hunting pressure and perhaps certain types of predation.

Examples of some of the changes in land use and farming methods which have greatly reduced the carrying capacity of much of our quail range may be listed as follows:

1. A great increase in mechanization of farming methods has resulted in much more and more rapid spring and

fall plowing that destroys both the food and cover formerly available in fallow and freshly harvested fields in winter and spring months.

2. Mechanization has reduced the number of fallow fields and semi-cleared areas that the old type farmer just never got around to cleaning up. This results in a permanent loss of food and cover.
3. The new idea of clean farming aided by the use of tractors, mowing machines, discs, bulldozers, weed burners, and airplanes for spraying weed killing chemicals has just about destroyed all of the natural quail food and cover on farms in many areas if not permanently at least for several critical months out of each year.
4. Modern farming methods have greatly reduced the need for planting grains and leguminous crops as food for live stock and tenants and these crops were a mainstay of the quail food supply.
5. Modern farming means more specialization and less diversification so common on the older cruder farms. This has reduced the general game food supply on the farm.
6. Mechanization on modern farms means more efficient harvesting, less waste of grain and seeds that in former years formed a part of the food supply for game on farms.
7. Great increases in cattle production and grazing has all but eliminated quail from certain areas of the State. It is hard to determine how much quail range has been lost this way but the heavily grazed unimproved pasture is virtually a biological desert where no type of wildlife can exist on these lawn like areas. Probably the main cause for nonusage of such lands by wildlife is the lack of protective cover (hedges and thickets) and travel lanes. Food is also a problem in some areas.

In addition to the changes listed in the utilization of land on our farms, some 2,000,000 acres of our cut over pine lands have produced less and less quail each year during the past 30 years because the land gradually reverted back to sedges and wiregrass rough neither of which will produce quail in great numbers. This cyclic change in plant types is characteristic in all long leaf pine land when freshly cut. For the first few years after cutting the land produces legumes and other plants very suitable for quail foods. Quail populations soar out of all proportions to the original population in virgin pine but this peak cannot be maintained and as the land reverts back to sedges and wiregrass the quail population declines and will remain permanently low unless additional foods are planted.

The present quail conditions in the state are pictured in the accompanying tables and map II (See Tables IV, V, VI, VII, VIII, IX, X and quail map). As study of the quail map indicates that the state may be divided into eight areas separated by topographical and ecological characteristics. Some of these areas are much better quail producers than others. A study of the tables (IV, V, VI, VII, VIII, IX, X), which are a tabulation of the data for each area on the map, will reveal the production of each area by parishes. Careful note should be made of the density or production on the occupied range which represents the carrying capacity of the available range in each area. The total amount of range in the area is also important because if only a small amount of range is available few birds can be produced no matter how good the available range.

The data summarized in the quail inventory tables indicate several facts about the present day quail conditions in Louisiana. In the first place four areas represented by Tables IV, V, VI, VII, are the best quail areas in the state and they average approximately 1 covey of 12 birds for each 70 acres of occupied range. This represents the lands with the best quail carrying capacity in the state. The carrying capacity is not the only important factor, however. In comparing the Northwest Louisiana uplands and the Central Louisiana uplands, two very similar types of area, a vast difference is noted in the total quail population even when the difference in size of the area is considered. The reason for this is the great lack of farm lands in Central Louisiana. Farm lands in this pine-hardwood area is the main quail range and the amount of it in an area is a clear index to the total quail population.

Farm lands in the Mississippi and Atchafalaya bottom land area (See Map and Table VIII) are the only quail range. It is in this area of cotton, sugarcane, and cattle production that new farming methods have taken its heaviest toll. The quail population in this area is off a full 50% from the original supply and in some places is nearly depleted.

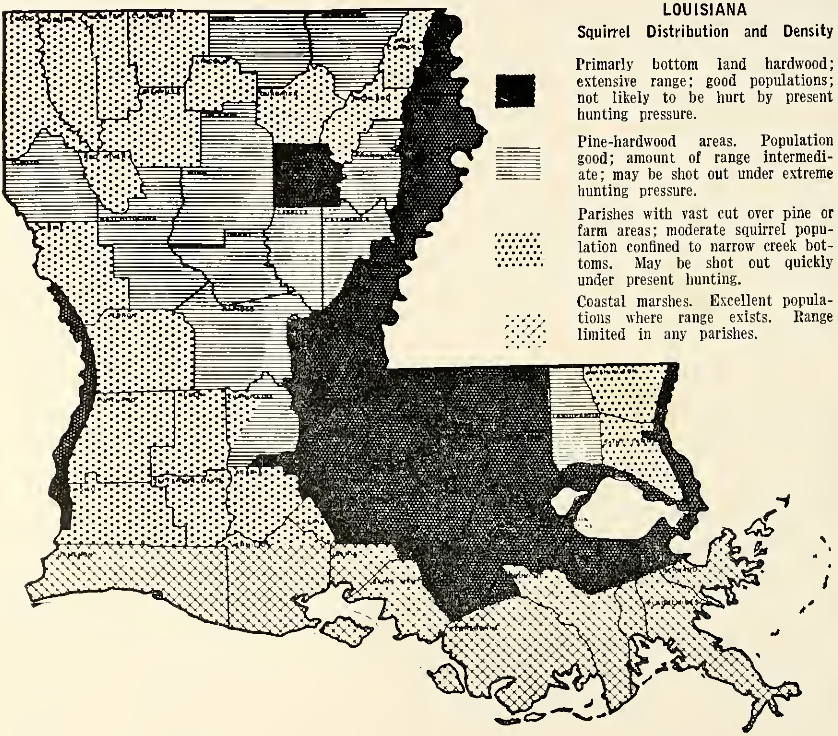
The southwest pine lands (See Maps and Table IX) are unique in that in this area quail have not had farms to depend on for food for the most part. Here once quail were plentiful shortly after the pines were cut but now the population is reduced at least 85%. This is a direct result of the reversion of the pine lands to sedges and wiregrass with an accompanying loss in food volume formally produced by the legumes that were so plentiful for a few years after the pines were cut.

The coastal marshes and the rice area are not shown in tabular form. These areas because of their topography and lack of food and cover suitable for quail are definitely not to be considered part of the potential quail range of the State. For all practical purposes the rate of production of the southwest pine lands and in the bottom land farm areas may be applied to the limited range in the rice and coastal marsh areas to determine the amount of quail present.

Summary: It is the opinion of this investigator that the quail ranges in Louisiana are producing the best they can under the present land utilization practices. Some ranges produce better than others because the methods of land use in one area are better for quail than in others. To materially raise the quail population of the State the carrying capacity of all of its ranges must be increased. This can be done by the planting of food and cover or by teaching the land owners not to destroy food and cover. Since the quail problem is primarily a problem of range betterment, it will of necessity go slowly until the majority of land owners are agreeable to make the necessary change themselves or to allow the State to make the necessary changes on their land which will produce more quail. The only exception to this is the vast cut-over pine land areas. It is reasonable to believe that the state could set up projects to rehabilitate the quail on large areas of this idle land.

Squirrel

Population, Range, and Annual Kill: The State of Louisiana has a relatively extensive squirrel range and moderately high populations and the hunting of squirrel is probably the major source of sport for Louisiana's 170,000 hunters. Of the 16,183,171 acres of forest in Louisiana approximately 13,000,000 are occupied squirrel range with population densities ranging from 0.1 to 2.0 squirrel per acre. These figures are in accord with Goodrum's studies in east Texas. This being the case the estimated total squirrel population in Louisiana is between 5,000,000 and 8,000,000 squirrels depending on the success of the annual breeding season. Offsetting this seemingly large number of squirrel in the state is the huge annual kill. Findings on this project indicate that the average kill for all hunters per man per season is about 20 and since an estimated 90% of the license holders hunt squirrel, the annual kill approaches an estimated 3,600,000. (Some question may be raised about the figure of 20 squirrel per season per hunter, but all studies indicates that well over 50% of all license holders hunt primarily squirrel and average a kill of from 50 to 80 per hunter per season. An annual kill of 3,600,000 leaves barely more than enough


LOUISIANA
Squirrel Distribution and Density
Primarly bottom land hardwood; extensive range; good populations; not likely to be hurt by present hunting pressure.
Pine-hardwood areas. Population good; amount of range intermediate; may be shot out under extreme hunting pressure.
Parishes with vast cut over pine or farm areas; moderate squirrel population confined to narrow creek bottoms. May be shot out quickly under present hunting.
Coastal marshes. Excellent populations where range exists. Range limited in any parishes.

breeding population to build up for so large an annual kill each succeeding year, which means that the stability of the present population may be in a precarious position and it certainly is not increasing noticeably.

Whether or not the present overall squirrel population is declining is difficult to determine accurately. Exact annual populations cannot be determined but from a study of the history of squirrel conditions in the state the following seems to be the picture. A great decline in squirrel population occurred with the decimation of our vast forest lands by the lumber companies between 1890 and 1925. Since then the population has become more or less stable. The ever increasing number of hunters in the state indicates that a decline may become severe when the annual kill fails to leave a necessary breeding potential. From the above figures on population and kill it is evident that this might happen at any time.

Aside from the overall squirrel picture in the state various range types and sizes make a considerable difference in how heavily a given area may be hunted without damage. The accompanying table and map (See Table X and Map III) gives a list of the parishes and their location in the state according to their relative squirrel population, extensiveness of range and ability to withstand severe hunting pressure.

Table X

Parishes listed according to density of squirrel population, extensiveness of range, and ability to withstand hunting pressure.

Heavy Squirrel Population (Col. I)	Intermediate (Col. II)	Low (Col. III)	Coastal Marshes (Col. IV)
East Carroll	Union	Caddo	Cameron
Madison	Morehouse	Bossier	Vermilion
Caldwell	Franklin	Webster	St. Mary
Tensas	Catahoula	Claiborne	Terrebonne
Concordia	Winn	West Carroll	Iberia
St. Landry	Jackson	Richland	Lafourche
Pointe Coupee	DeSoto	Ouachita	Jefferson
Avoyelles	Natchitoches	Lincoln	Plaquemines
West Feliciana	Calcasieu	Bienville	St. Bernard
East Feliciana	Jefferson Davis	Red River	Orleans
East Baton Rouge	Acadia	Sabine*	
St. Helena	Rapides	Vernon*	
Ascension	Tangipahoa	Allen	
St. James	Washington	Beauregard*	
St. John the Baptist	St. Tammany		
Livingston	Lafayette		
St. Martin	Grant		
Iberville	LaSalle		
Assumption	Evangeline		
West Baton Rouge			
St. Charles			

Column I:	Primarily bottom land hardwood areas, extensive range, good population and plenty of natural protection for squirrel. (Not likely to be too badly hurt by present hunting pressure).
Column II:	Mixed hardwood and pine or second growth areas, intermediate amount of range. (May be shot out if hunted heavily.)
Column III:	Parishes with vast cut-over or farmed areas. Squirrel range confined to narrow creek bottoms. (May be shot out quickly.)
Column IV:	Coastal Marshes. Excellent populations where range exists. Range is limited in many parishes.

* Excepting Sabine River Bottom.

In the above table, (Table X), Column 1 lists those parishes in which the squirrel range is extensive and the population good. These parishes are primarily in the bottom land hardwood sections and the vast wooded areas act as a protective mechanism to the squirrel. Heavy kills are forthcoming from these parishes annually without any demonstrable damage to the squirrel population and it is doubtful whether the present hunting pressure will severely damage these areas.

In Column II the parishes listed have an excellent type of squirrel range and the population density per unit area is high but the overall acreage of range is limited thereby limiting the total squirrel poulation in these areas. Heavy hunting pressure in these parishes is marked by a decline in the shooting population before the end of the season so that hunting becomes difficult without dogs some 30 or more days before the end of the season.

Column III: This group of parishes has an excellent but very limited type of squirrel range which is almost entirely confined to relatively narrow creek and river bottom areas. The overall population here is necessarily limited because of the limited range. In such areas only moderately heavy hunting pressure is sufficient to reduce the population in 30 days time to a point that makes it unprofitable to hunt.

Column IV: The coastal marsh parishes have not been studied to any extent but in those which have extensive squirrel ranges they should be classified in Column I.

The Breeding Season and Its Relation to the Time of Hunting and Population Increase

Squirrels are prolific breeders but at best they are barely able to maintain their populations in the face of heavy hunting pressure. It has been demonstrated by Goodrum is east Texas that both fox and gray squirrel breed twice a year and in some cases more. This is fully substantiated by observations made in Louisiana. The summer breeding season shows young being dropped and suckled from June to October 15. (Observations by our field men during the first week of September were made of two litters with eyes still closed. These young will be dependent on the mother well through the month of September and most of October. It is also true that many females killed in late October are still suckling their young.)

The winter breeding season begins with rutting in late December and early January with a majority of the females carrying young in late December, January, and February. Evidence is cited by Goodrum that probably the winter season is the heaviest and most important in maintaining a good population. It is evident from the time of the breeding seasons that the optimum hunting season should be from November 1 to December 15 and in no case should it be earlier than October 15 or later than January 1 if the maximum breeding potential is to be maintained. With these facts in mind it is clear why illegal or legal kills at any time other than during the months of late October, November, and December is so damaging to the total squirrel population because for every female squirrel killed in any other month, not one but from three to five young are killed in addition.

Factors Limiting Squirrel Populations

The factors which limit squirrel populations in Louisiana may be enumerated as follows:

1. Limited range in some sections of the state.
2. Heavy illegal and legal kills during parts of the breeding seasons.
3. Extensive timber operations particularly in those parishes where the range is limited.
4. The destruction of den trees in any timber operation.
5. Heavy grazing by cattle and hogs. (Moderate grazing seem to help squirrel populations.)
6. Severe winters.
7. Forest fires.

Summary

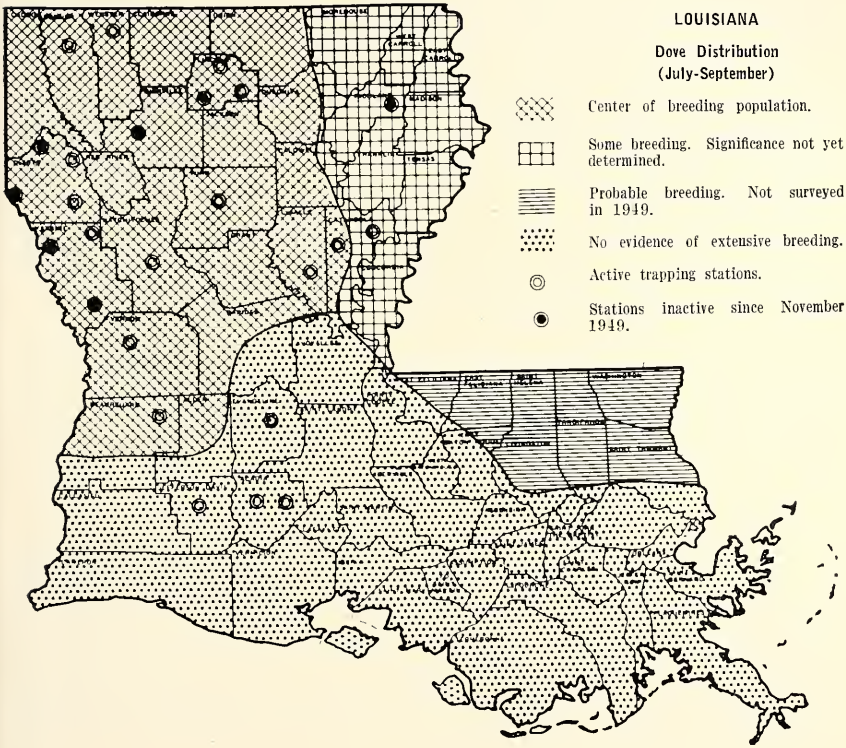
The above discussion may be summarized as follows: Louisiana has an excellent squirrel population but it is subjected to a heavy hunting pressure. At present, studies indicate that a precarious balance exists between the breeding potential and hunter kill and that in many areas the kill could become too heavy and a decline would result. Considering the time of the summer and winter breeding season in Louisiana, the squirrel hunting season should never be opened before October 15 nor remain open later than January 1, and the best results would probably be obtained with a season from about October 22 to December 20.

Project 15-R Mourning Dove Study

This project was initiated on July 1, 1949 and is being carried out simultaneously with identical type project in all of the Southeastern states. The purpose of this work is to correlate findings over the entire Southeastern part of the U. S. in hopes that some type of management plan and shooting regulations can be devised to save the nation's dwindling dove supply.

Work plans called for setting up 20 trapping and banding stations throughout the state, making population studies by road counts, conducting hunter bag checks during the hunting season and making nesting studies.

During the month of July, 1949, our efforts were directed toward constructing traps and doing experimental trapping. Our required number of 200 traps were made during July and August and we started setting up trapping stations in August.


LOUISIANA
Dove Distribution
(July-September)
Center of breeding population.
Some breeding. Significance not yet determined.
Probable breeding. Not surveyed in 1949.
No evidence of extensive breeding.
◎ Active trapping stations.
◉ Stations inactive since November 1949.

By the end of August 15 trapping stations were in operation principally in the northern half of the state. In October doves began moving out of the northern part of the state and concentrating in the rice fields. At this time several of the original stations were discontinued and others were set up in the southern section of the state. Presently there are 18 trapping stations in operation. (A map showing distribution of trapping stations is included in this report, see map IV.)

Trapping success was rather poor until November, when there was a considerable increase number of doves trapped and banded. To date there has been approximately 350 doves banded.

Read counts of a general nature were conducted during July, August and September; 1,835 miles of road were censused and 291 birds counted giving a ratio of one bird per 6.2 miles of road censused. During October, November, and December the general road counts were replaced by regular 25 mile routes, censused once each week, this represented 550 miles of road censused during the quarter and 147 birds were tallied, giving a ratio of one bird per 3.7 miles censused.

Hunter bag checks were conducted throughout the month of December. Hunting pressure on doves was found to be most intense in Acadia Parish, and hunting success was found to be relatively poor.

No nesting studies have been conducted to date, but study plots are being set up so that this part of the project can be carried out during the present year.

During the week of February 6-10 a region wide inventory of the dove population is to be undertaken by all the states of the southeastern region. Louisiana is co-operating in this work and all available P-R personnel are to be used.

Project 17-R Migratory Waterfowl Investigation

On July 1, 1949, work was initiated on a new project entitled Migratory Waterfowl Investigation (17-R). The work plan is tentatively set up for a duration of two years for the purpose of determining whether or not four areas in north Louisiana can be made more attractive to waterfowl. These areas include Lake Bistineau, Black Lake, Catahoula Lake and Marengo Bend, a section of the Mississippi River.

In approaching the final conclusion the information believed to be necessary involves vegetative studies, to determine the present food supply, waterfowl population studies, and experimental food plantings.

To date vegetative and population studies have been under primary consideration upon the above areas. Initial plant studies on Lake Bistineau reveal that the lake supports a heavy growth of aquatic vegetation of which approximately 90% is valueless to waterfowl.

Plants listed as of very little value to waterfowl are giant cut-grass *(Zizaniopsis miliacea)* alligator wood *(Alternanthera philoxeroides)*, yonkapin *(Nelumbo pentapetal)* and white water lily *(Nymphaea odorata)*, willow *(Salix nigra)* and water elm *(Planera aquatica)*, fanwort *(Cabomba caroliniana)* and various species of waterweeds *(Anacharis)*.

Cypress and coontail *(Ceratophyllum demersum)* both of questionable value in this area, were found growing in varying quantities throughout the lake. Two excellent aquatic food plants found to occupy a small percentage of the total area are the duckweeds (both *Wolffiella* and *Spirodela*), and the smartweeds *(Polygonum)*.

Just as the value of aquatic vegetation may be classed as poor, the terrestial plants, or those growing on the sloping banks may be termed excellent.

Flats exposed during the early fall at an elevation of 136′ supported very good stands of moist soil plants.

Thick growths of teal grass *(Cyperus erythrorhizos)* Walter's millet *(Echinochloa walteri)*, smartweed *(Polygonum)* may be found. Also buttonweed *(Drodia virginia)*, buttonbush *(Cephalanthus occidentalis)* and various species of Panicum and Carex may be found to a lesser extent. All of these plants are very good waterfowl food plants with the first being not only the most important but by far the most abundant.

Willow oak or pin oak *(Quercus phellos)* may be found growing abundantly in some of the bottoms, subject to winter flooding and is perhaps the most attractive plant to waterfowl in the area. Present plans call for increasing the water level by four feet and if this water level is stabilized throughout the year, all of the flooded oaks will undoubtedly be killed. If the water levels can be lowered in the summer the oaks should survive and provide a perennial food supply for the waterfowl coming into the lake.

Initial vegetative studies have been made in and around the other areas and will be continued within the coming months.

Waterfowl flight records were kept on Marengo Bend and Lake Bistineau, with the idea that these widely separated areas would provide accurate data on waterfowl passing through north Louisiana.

Censuses were made on a weekly basis and began at Marengo Bend on August 18th with the arrival of 34 blue-winged teal. The weekly census began on Lake Bistineau September 21, 1949 and covered a small portion of the lake lying just north of the dam.

Both areas exhibit patterns which are almost identical except for minor species variation which may be attributed to habitat differences. The census records indicate that the ducks stopped in north Louisiana for only a few days during early November and then passed through and did not return during the legal hunting season. Although periodical census records were not kept on Catahoula Lake, indications were that it was the only area in north Louisiana to hold an exceptionally high waterfowl population throughout the winter. The wide and open areas and the abundant food supply of Catahoula Lake held thousands and thousands of ducks throughout the winter while the other areas held only a small resident population.

Census records are shown in Tables I and II below. Kill records were kept whenever possible and Table #III (below) shows, in 108 hunts averaging 4 hours each, 105 ducks were taken and 15 known cripples escaped.

Banding operations have been conducted on Marengo Bend and 29 blue-winged teal, 33 mallards, 2 green winged teal, seven wood ducks, and four pintail were banded for a total of 75.

Table 1

CENSUS RECORD—MARENGO BEND

	B. W. Teal	Pintail	Mallard	Wood Duck	Shoveller	G. W. Teal	Baldpate	Gadwall	Ruddy	Ring Neck	Scaup
Aug. 18 .	34										
Aug. 25 .	44			2							
Sept. 1. .	16			4							
Sept. 7. .	16			10							
Sept. 14.	19	2		6							
Sept. 21.	14			8							
Sept. 28.	16	1		2			1				
Oct. 5. . .	40	4	6	6			1				
Oct. 12. .	62	24	7	8	2	40	1				
Oct. 15 (In a one hour count between 1:00 and 2:00 P. M. 1,100 blue and snow geese, with possibly a few Canadian, were observed flying over, marking the first big flight of the year.)											
Oct. 19. .	206	110	54	15	8	160					
Oct. 24 (Second big flight of geese noted. 800 blue and snow geese counted during a one hour count from 10:00 to 11:00 A. M.)											
Oct. 25 (Heavy flight of geese still progressing in equal numbers as noted on Oct. 24.)											
Oct. 26. .	190	140	65	54	11	210		96	6		
One flock of blue geese, 11 juveniles, 13 adults											
Nov. 2 . .	160	95	450	62	45	550		140	110	36	40
Two flocks of blue geese; 48 juveniles, 35 adults.											
Nov. 9 . .	18	45	320	8	42	240		110	62	45	85
Nov. 16 .		6	92	9	44	76		22	52	6	60
Nov. 23 .		4	22		18	34		16	35		44
Nov. 30-Dec. 15 About the same as No. 23 census.											

Table 2

CENSUS RECORD—LAKE BISTINEAU

	Mallard	Wood Duck	Pintail	Gadwell	Scaup	Ring Neck	G. W.	B. W. Teal
Sept. 21......		50	10					75
Sept. 28......		150						250
Oct. 5........	7	150	12					200
Oct. 12.......	25	150	25				45	250
Oct. 19.......	40	150	40	35	40	30	150	250
Oct. 26.......	150	150	75	100	150	125	200	200
Nov. 2	1,500	150	500	600	2,000	2,000	1,000	200
Nov. 9	150	20	25	75	350	75	150	200
Nov. 16	35	20	25	125	300	100	50	
Nov. 23	2	5			20	10		
Nov. 30-Dec. 15	Similar to Nov. 23							

Table 3

HUNTER BAG CHECKS
WATERFOWL

Sept. 18-Dec. 15 1949

Data

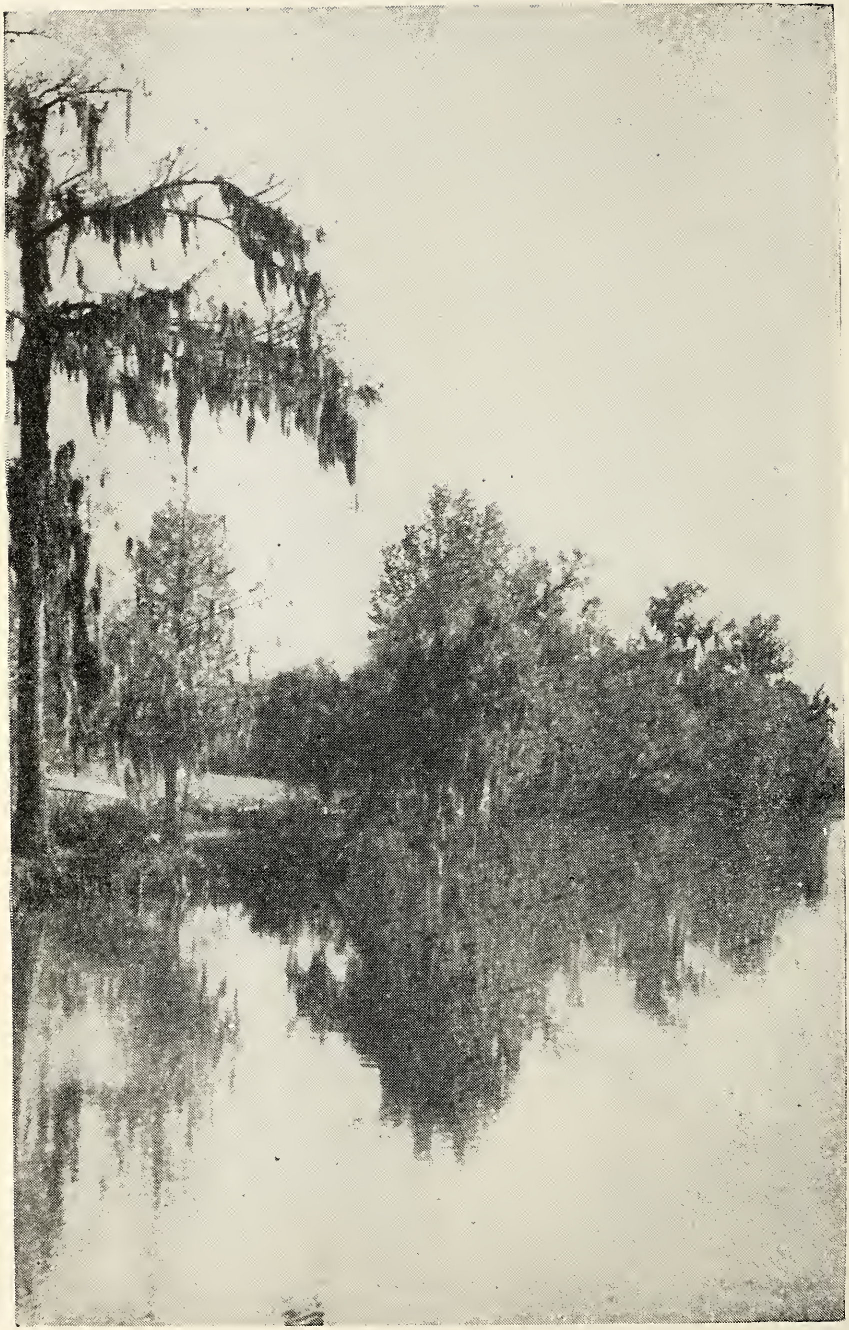
Total No. of Hunters	108
Man Hours Hunted	422
Mallard	50
Pintail	7
Shoveller	3
Gadwell	2
Black Duck	3
B. W. Teal	1
G. W. Teal	11
Wood Duck	9
Scaup	9
Ringneck	9
Mergansers	1
TOTAL DUCKS	105
Unretrived Ducks	15

PITTMAN-ROBERTSON

REPORT OF EXPENDITURES

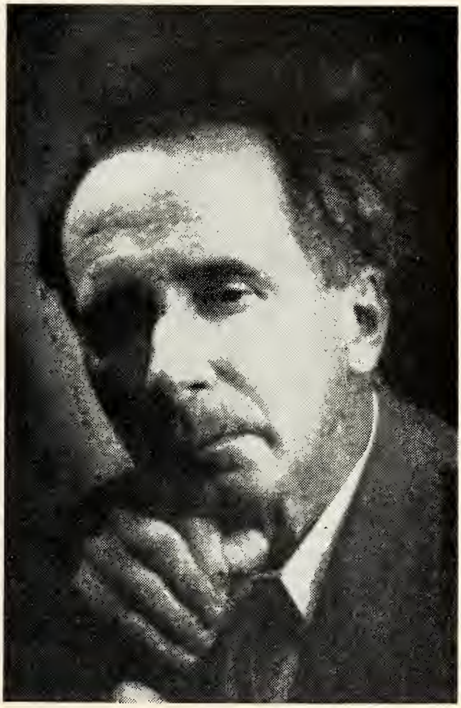
FISCAL YEARS 1947-48 AND 1948-49

Account No.		Actual 1947-48	Actual 1948-49
101	Salaries	$ 36,190.19	$ 37,556.27
201-04	Insurance	361.94	597.83
201-06	Printing	......	155.03
201-08	Repairs	1,049.58	1,945.43
201-09	Telephone and Telegraph	510.00	766.94
201-10	Other	326.00	919.88
215	Postage and Transportation	80.53	147.99
211-00	Travel	8,787.70	5,213.98
301-03	General Plant Supplies	4,516.17	5,299.17
301-06	Automotive Supplies	1,340.62	3,645.40
301-07	Office Supplies	......	181.97
301-08	Building, Ground Maintenance	453.91	2,653.29
401-06	Retirement	......	1,695.03
501-01	Automotive Equipment	11,120.47	3,838.05
501-07	Office Equipment	78.38	962.04
501-04	Farm Equipment	580.00	223.38
501-12	Livestock	......	1,500.00
701	Buildings	......	18,623.00
	TOTALS	$ 65,395.49	$ 85,924.68
	State Share	44,643.89	53,987.82
	Federal Appropriation	$133,931.68	$161,963.45
		$178,575.57	$215,951.27



REPORT OF JAMES NELSON GOWANLOCH

Chief Biologist



Dr. James Nelson Gowanloch

The duties of the Chief Biologist of the Department of Wild Life and Fisheries involve a wide variety of activities. It is the purpose of this report to give, as far as space permits, some survey of these fields of responsibility. Involved are planning and execution of specific short range and long range programs, participation in an advisory capacity in various other programs in which he is not actively concerned, the carrying out of immediate researches, the need for which may arise often in an emergency manner, the constant survey of the most recent published results of other research agencies in field significant, as far as the welfare of Louisiana wildlife and fisheries resources are concerned, the provision of information upon direction of the Commissioner to business enterprises, research bodies, educational institutions and individual researches and individual laymen, of information which they request regarding our present knowledge of the wildlife and fisheries resources of the State of Louisiana, the identification (or the routing of to the appropriate specialists) of submitted specimens that have frequently considerable economic interest and often high scientific interest; cooperation with other State agencies where problems of mutual interest arise (such problems often have the greatest economic importance), the dissemination of our knowledge of the natural resources of Louisiana and their value through the media of correspondence, published articles, addresses and radio and television appearances; participation in the activities which involve sessions of sportsmen's organizations, of interested industrial organizations, of associations primarily concerned with natural resources such as, for example, the National Shellfisheries Association; of associations wherein meet the greatly overlapping interests of science, education and industry, for example, the Southern Association of Science and Industry; of regional concerted institutions, for example, the Gulf States Marine Fisheries Compact; and still more widely the extended interests which are yet deeply involved in the welfare and interest of Louisiana's natural resources such as the Gulf and Carribbean Marine Fisheries Institute, the North American Wildlife Conference, and the activities of those agencies of the United Nations, which agencies have joined together in thought and work in an endeavor to achieve a program of long range in time and worldwide in extent to make the best use of and at the same time conserve the natural resources that are available. It would surprise many citizens of Louisiana to realize how important a part the resources of Louisiana, and of the waters of the Gulf of Mexico along its coast, present in this sweeping pattern.

This may seem perhaps exaggerated to those who are not familiar with the way in which state, national and international natural resources values have now become bound inextricably together.

The Chief Biologist at all times must be available to provide, in an organized fashion, information pertinent to the utilization, expansion and, at the same time, conservation of the biological resources of the State, insofar as they fall within the provisions of interest and jurisdiction of the Louisiana Department of Wild Life and Fisheries.

"Management" of Lakes and Other Waters for Good Fishing

The term "lake management" is used by biologists to describe the program undertaken to improve lake conditions for sport fishing. This program must usually be tailored to fit the specific lake involved since, although there are certain broad, always applicable, principles, the details of procedure involved in the improvement or rehabilitation of a particular lake may differ widely.

Since the Chief Biologist is constantly called upon to answer such inquiries and to conduct surveys of lakes and to provide advice as to remedial measures useful in restoring lakes by such a program, the purpose of the present report is to present these broad principles and by specific example indicate how they can work.

Space necessarily limits this discussion, but it is deemed nevertheless useful to set down these broad aspects of lake management so that sportsmen can themselves understand why some factor, or factors, such as, for example, depth of lake, direction of prevailing winds, changes in water level, extent of watershed, origin of water inflowing to the lake, (whether from surface drainage, inflowing bayous and rivers), presence of coarse fish, kind and quantity of submerged and floating vegetation, freedom of spawning areas from silting, all of which may separately seem to the sportsman to be not particularly connected with good fishing, may one, several or all control the productivity and usefulness of the fishing lake.

It is hoped that this discussion will serve in itself to answer at least some of the questions which constantly are directed to the Chief Biologist.

Fish, like all other organisms, depend upon three basic factors for their successful life:

1. A healthy home, which the scientist prefers to call "habitat";
2. Sufficient food supply;
3. Conditions favorable to successful reproduction so that the supply of fish can equal or exceed the "fishing pressure" exerted upon that body of water by sportsmen or other fishermen.

With this breakdown as a starting point, it is possible to describe in basic outline some of the factors that can make or can destroy a lake as a fishing asset, some of the remedial measures that can be put into operation (these measures have been tremendously improved by science within very recent years) and also to provide a description of some of the quite erroneous interpretations that are believed concerning the deterioration of fishing lakes by sportsmen who simply conclude that something that they see, near at hand, is the immediate cause of the decline in those fishing areas. The actual operating influence is usually something quite else again.

During nineteen years as Chief Biologist of this Department and its predecessor, the Department of Conservation, the writer has had occasion to examine innumerable examples of lakes that have fallen into bad and even useless condition. Sometimes the corrective measures were simple; sometimes because of considerations of other economic values or other considerations such as drainage necessities or flood control, the program necessary to bring the lake back into condition simply could not, from a practical point of view, be set in operation.

It is the belief of the writer that some broad concept of the way in which a lake works physically and biologically would help every sportsman to appreciate the basic need of carefully acquired, accurate information before arriving at a precipitous decision that what seven other fishermen told him must constitute the entire truth involved in the entire matter.

This discussion will, therefore, break itself down into three consecutive parts (as above indicated) with appropriate citation of specific Louisiana examples.

First, the welfare of game fish in relation to the waters in which they live, viz., their specific physical habitat.

First of all, it must be realized that a body of water, such as a lake, is a complex world in itself as far away as possible from the simple pattern of a bathtub filled with tap water. Lakes are the result of often hundreds and even a thousand years of the operation of physical and biological influences that have slowly but very surely brought the body of water into a state of reasonable "equilibrium" whereby bottom conditions, water conditions, conditions of vegetation and the population of game and game fish, forage fish (the fish that sustain predacious game fish), the food of forage fish, the food that provides in turn the food for those organisms upon which forage fish live and the food, often microscopic, utilized by many fish directly because of the special equipment of these species, have all through long interaction become stably adjusted.

As a physical body of water alone, the lake is subject to many influences, chiefest of these are dissolved oxygen without which neither the fish nor their food can survive; second, temperature; third, currents which result either from inflow of water or from wind agitated waves; and, fourth, the factor of industrial or other pollution which is quite capable by direct poisoning action of rendering an otherwise "good" lake a thoroughly "bad" lake.

First, in the absence of dissolved oxygen, fish inevitably perish. Incapable of deriving their oxygen from the oxygen bound up with the water, fish must acquire their essential oxygen for breathing from oxygen dissolved in the water itself. This dissolved oxygen is derived from two sources: first, and most important, the action of plants (the "oxygenating" plants) which, using the energy of sunlight and the carbon dioxide present in the water, build up their own structures and at the same time produce free oxygen; second, the oxygen absorbed from contact with the air. This absorption is particularly accelerated by the action of waves and such action can be "damped" and even completely eliminated by the presence on the surface of the water of broad leaved, floating plants such as the American Lotus, hereinunder described.

The amount of dissolved oxygen that water can absorb at various temperature levels is indicated in the following tabulation. The values are expressed in figures which represent, first, parts of dissolved oxygen per million by water in fresh water saturated with oxygen, and, second, the temperature of the water at the saturation point.

Dissolved oxygen (saturation) in parts per million of water	Temperature (degrees fahrenheit)
14.62	32
12.80	41
11.33	50
10.5	59
9.17	68
8.38	77
7.63	86

The amount of oxygen that water can absorb is a result of ascertained physical laws in relation to temperature.

Although fish may survive for short periods of time at low dissolved oxygen levels, they cannot endure such oxygen decrease long because not only do they consume oxygen by their muscular activities, but the death of the first fish and the subsequent putrefaction of these fish in turn accelerate the oxygen reduction and unless this condition is alleviated a vicious circle is set up with violently rapid and increasing oxygen exhaustion and, often, resulting spectacular "fish kill" with the death of thousands upon thousands of valuable game fish.

Various factors little understood by the sportsmen may cause this disastrous cycle. Compactly stated, these are some of the factors described below.

If then there should occur a series of warm cloudy days two things, both detrimental to fish, will occur. First, because of the rising temperature the water will then lose some of the oxygen that is dissolved in it. Second, because of the lack of the energy of the sunlight the plants reduce or cease their photosynthesis and will correspondingly decrease or entirely halt their production of the oxygen valuable to the aquatic animals present. Ordinarily these events do not produce results serious enough to damage fish. If, however, some additional sudden demand for the dissolved oxygen in the water occurs, oxygen essential for the survival of the fish may rapidly fail until under acute circumstances no oxygen at all may remain.

Fish under such circumstances immediately show distress by irregular swimming movements, by gulping air at the surface of the water, by losing their normal hydrostatic control, and floating belly upwards, and finally they may die.

It will be noted that often all the older fish will die, although the younger fish will be first to show the signs of distress.

Another factor that often operates severely in creating lack of oxygen in bodies of water is the fact that seasonal changes in temperature may kill aquatic plants and the resultant decaying vegetation will itself burn up much of the available oxygen.

Sportsmen and fishermen should realize that such sudden death of numbers of fish under these circumstances may be due to entirely normal natural causes, which causes fortunately are usually transient, and a return of the normal healthy condition of the water may be hastened quickly by sportsmen using the simple method, in certain cases of small ponds, of promptly removing all dead fish and agitating (and thus oxygenating) the surface water by outboard motors on anchored boats with propellor blades partially exposed.

Stratification

An essential, and indeed little understood factor, is that lakes because of seasonal temperature undergo what is known as stratification, as illustrated in the accompanying diagrams. Warmed by the sun, the upper layer levels may become a mass of warmer and lighter water. When this becomes sufficiently different in density from the lower, cooler water, a "shear line" is formed and when winds blow upon the lake, the water instead of circulating as a whole unit becomes divided into an upper warmer mass (known technically as the *epilimnion*) shearing across a differential temperature zone (known technically as the *thermocline*) below which lies a cool, non-circulating mass usually containing no oxygen (known technically as the *hypolimnion*).

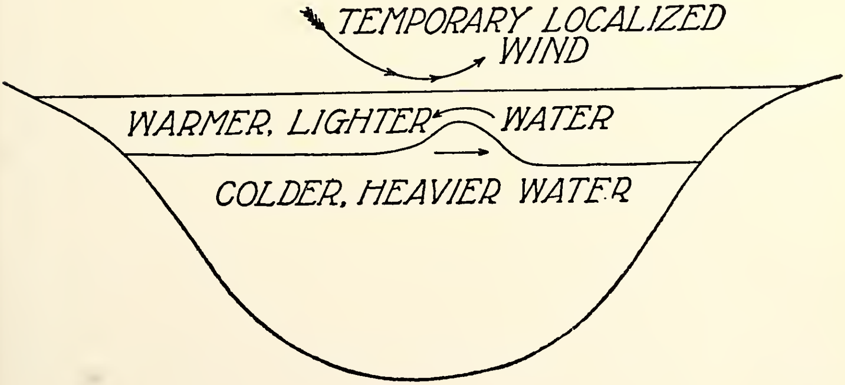


Diagram showing formation of subsurface wave by the action of a temporary localized wind. The wave is in the heavier, underlying water, and moves forward in the direction of the wind. Surface, water, however passes over the crest of the submerged wave and surface current may thus be produced against the wind.

Such action may be local as the result of a temporary wind, as shown in the first diagram, where prevailing winds persist, however, the whole lake, as shown in the second diagram, may change its circulating pattern completely and thus consist of an upper oxygen containing mass which circulates completely as a unit as a result of wind agitated movements but shears off at a level above the stable oxygen-free lower, cooler mass.

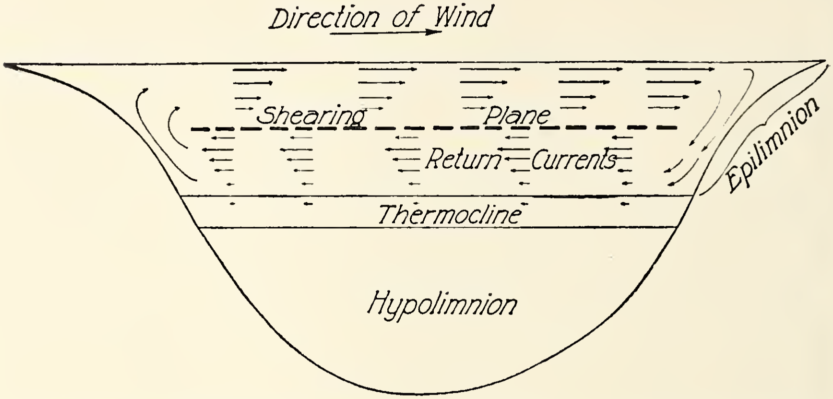


Diagram showing character of water circulation in the epilimnion and formation of a shearing plane. Difference in length and width of arrows represent difference in velocity of water movement. Such a circulation depends upon wind of sufficient velocity and duragtion to produce it.

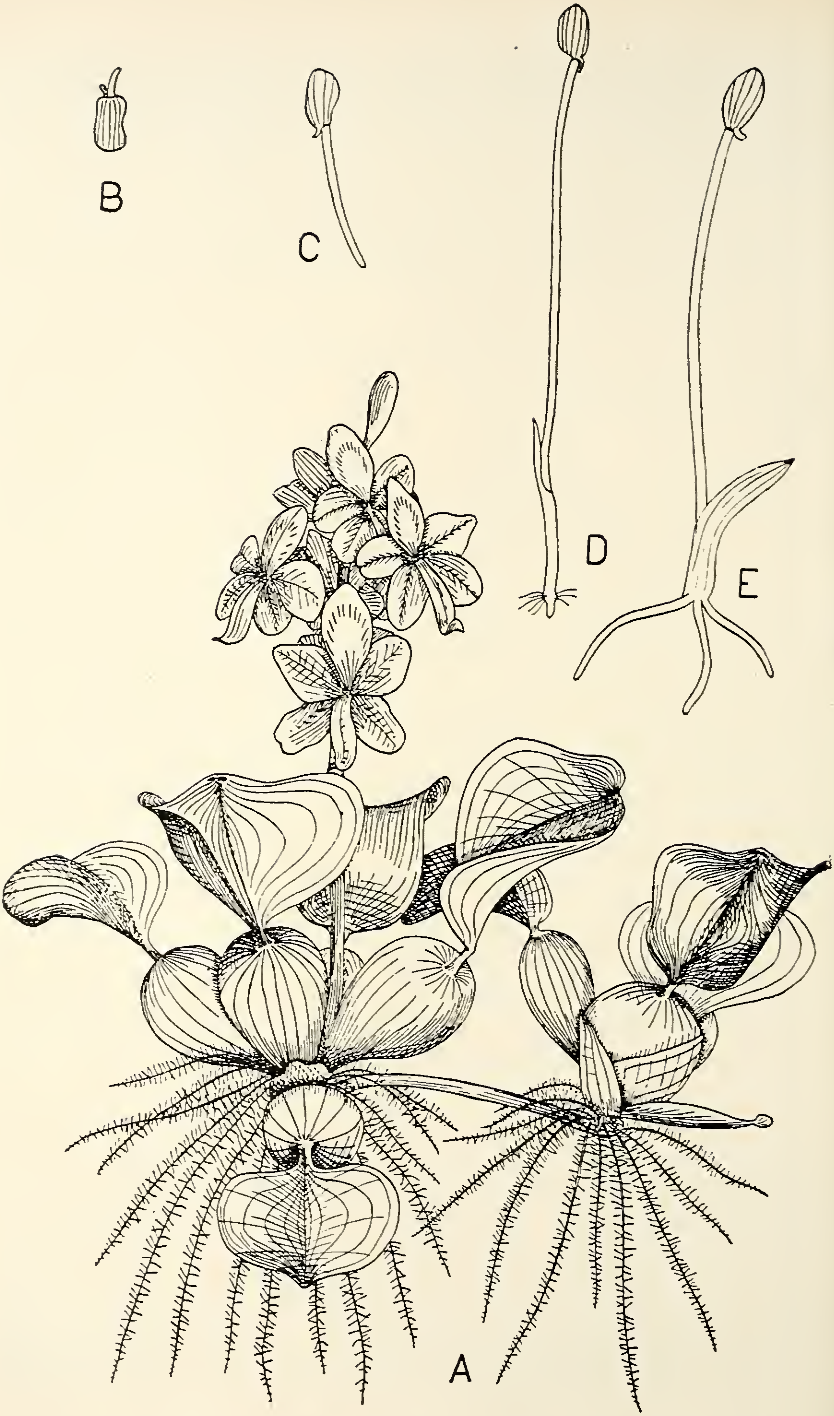
This may seem complicated to the sportsman, but it is of greatest importance for the reason that due to certain conditions herein described, the whole lake may suddenly "turn upside down." The fish swimming naturally toward the surface in the oxygen containing water may suddenly find themselves in water that contains no oxygen at all and perish from asphyxiation. The conditions that would bring this about may be many and will depend upon the specific lake. The writer has personally investigated numerous instances of this cause of disastrous "fish kills" in Louisiana lakes. The chief cause, for example, may be the advent of cool, cloudy weather. The upper, oxygen-containing mass of water becomes cooler and heavier than the lower, formerly cooler, mass of water that contains no oxygen, and the lake will suddenly "turn over." At the same time, the absence of sunlight will cut down the oxygen production of the plants and the fish will within a matter of hours begin to die, thus burning up more oxygen than ever and causing disastrous vast mortality. The writer has seen instances where the only surviving animals were gars and turtles, both of which breathe air.

Another very frequent cause of such fish kills results from sudden heavy rainfalls succeeding long periods of drought. In such instances, the surface water sweeps from the whole watershed into the lake accumulations of "oxygen hungry" organic materials from the land which materials burn up the dissolved oxygen and quickly bring the fish to a state of oxygen starvation and subsequent death.

Still another cause occurs when the lake is suddenly "fertilized" by inswept surface materials which lead to a tremendous "flowering" of microscopic plants. One of two, or both of two, results may follow. First, the fertilizing material, with the subsequent growth of microscopic plants and other organisms, may render the surface water opaque (the writer has observed Louisiana lakes whose surface looked as if they were composed of solid "Paris Green") and thus screen out the light from submerged, oxygenating plants, and cut off completely their production of oxygen. Second, the sudden subsequent death of these microscopic organisms, in incalculable numbers, due usually to the exhaustion of the materials (fertilizing materials) necessary to sustain their life will die and by their putrefaction will directly exhaust the available oxygen and kill the fish.

Yet another cause capable of completely destroying the use of the lake for fishing is the character of "above water," of "floating" and of "submerged" vegetation. The principles fundamentally involved are here set down with several illustrations of the plants concerned.

First of all, sufficient vegetation in the shallower marginal areas is necessary to afford three things: first, adequate habitat for the development of the food for water fleas and other small aquatic animals upon which small fish live; and, second, adequate protected nursery grounds for the young game fish that are growing up (since many of the game fish are, after a certain period of parental care of their young, highly cannibalistic and destroy them in great numbers; and, third, the adequate action of such plants in keeping the dissolved oxygen supply available.



THE WATER HYACINTH: Herewith are shown the development of the exceedingly objectionable Water Hyacinth. Figure A shows normal plant; B, seedling protruding from the seed coat; C, seedling emerging from seed that has been exposed to the air; D, seedling germinated in water; E, seedling germinated on land. **(After Muenscher.)**

Certain species of introduced plants, notably the Water Hyacinth, and the Alligator Weed (locally called Alligator Grass) can completely blot out the surface of the lake and render that lake sterile of game fish, food for game fish, available oxygen and of useful underwater plants.

This Department has worked out effective yet harmless methods of chemical control of Water Hyacinth which are, in terms of expense, practical. In one experiment, for example, which was conducted under the writer's personal observation, an area of twenty-seven hundred acres was dusted by a plane with a resulting ninety-five percent plus destruction of the Water Hyacinth present. Other methods of applying the chemicals fatal to Water Hyacinth, yet in the concentrations used completely harmless to man and to all domestic animals, have been worked out by the use of pumps spraying from surface boats.

The Alligator Weed, unlike the Water Hyacinth, exists both on the water and on the land. Furthermore, it is more highly resistant than is the Water Hyacinth, yet nevertheless methods for its control seem within reach, also using chemicals harmless to fish or other animals.

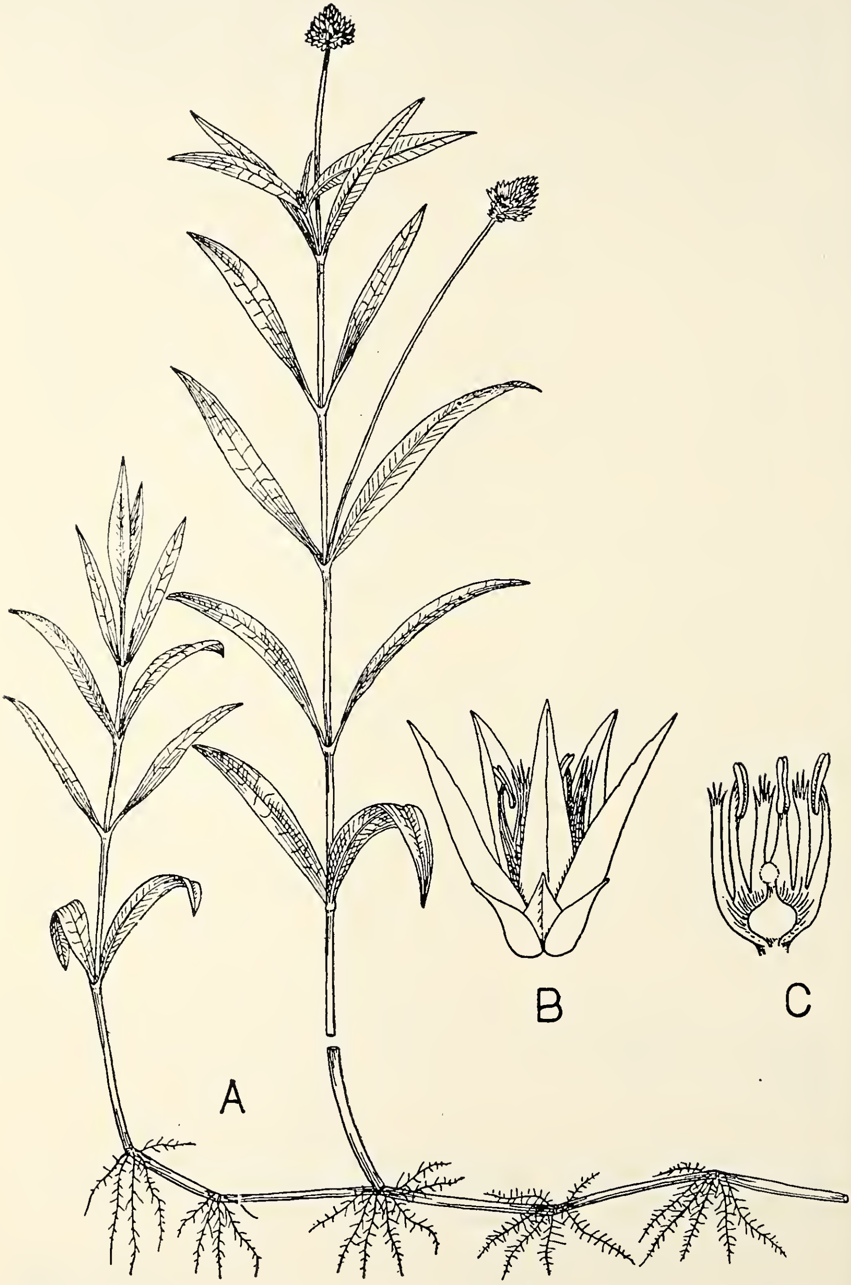
The writer some years ago was asked to form a committee of which he was asked to be chairman, which committee would serve as a Biological Advisory Committee to the States Park Commission.

The primary target for investigation was the well-known two thousand acre impounded lake, Lake Chicot in Chicot State Park, Evangeline Parish. This lake is fortunate in having no infestation whatever of either Water Hyacinth or Alligator Weed.

The scientists forming this committee, after careful investigation, recommended that the lake, which was in bad condition, be brought under control by a method known as "winter drawdown."

The plants involved were three, all of which are here illustrated, and all of which, oddly enough, although greatly different in appearance, belong to the Water Lily family.

The first plant, *Cabomba caroliniana,* known locally simply as "water weed" or "water moss," grew in such profusion that



ALLIGATOR WEED (ALLIGATOR "GRASS") The Alligator Weed (Alternanthera philoxeroides), an extremely bad plant in Louisiana. Completely amphibious, it is capable of growing adrift on the water. **(After Muenscher.)**

it obstructed fishing by tangling up lures, and also produced such abundant food that the fish disdained bait, artificial or natural.

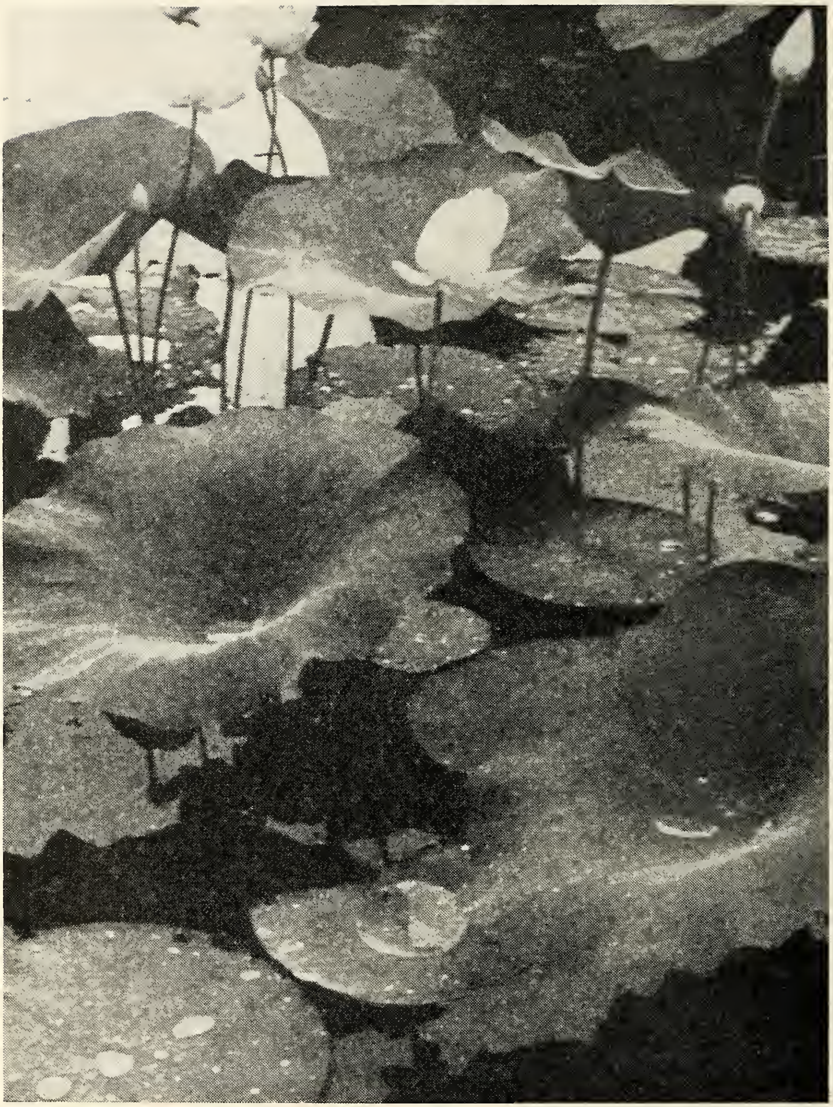
The second plant, known as *Brasenia schreberia,* or water-shield, and characterized by possessing floating, deep olive green leaves, which lack the cleft present in ordinary Water Lilies, and still more easily identified because of the fact that all of its submerged parts, including the red undersurface of the floating leaves, are covered with a thick layer of clear, peculiar jelly, blocked fishing, and blocked also the light necessary for the welfare of useful, underwater plants.

The third plant, the American Lotus, known locally as nienock and yonkapin, is one of the most conspicuous of all of our water plants. At first, its leaves emerge but later float and are most readily identified because the upper surface of the leaves is coated with a waxy substance which causes water drops showing on the leaves to appear like drops of mercury.

The magnificent flowers, nine inches in diameter, are cream to pink in color, are fragrant and become, when the seeds form, peculiar structures resembling the head of a watering can. They contain large seeds which were used both by the Indians and by early settlers as food. The blossom of the American Lotus, as shown in the illustration, has the very peculiar habit of first appearing erect above the water, opening in the morning, closing at night, shedding its petals two days later and four days thereafter bending to a forty-five degree angle with the "face" of the fruiting body toward the East. The fruiting body continues to bend until it reaches a right angle, then shrinks, turns completely downward, breaks off, floats away, rots and releases the seeds.

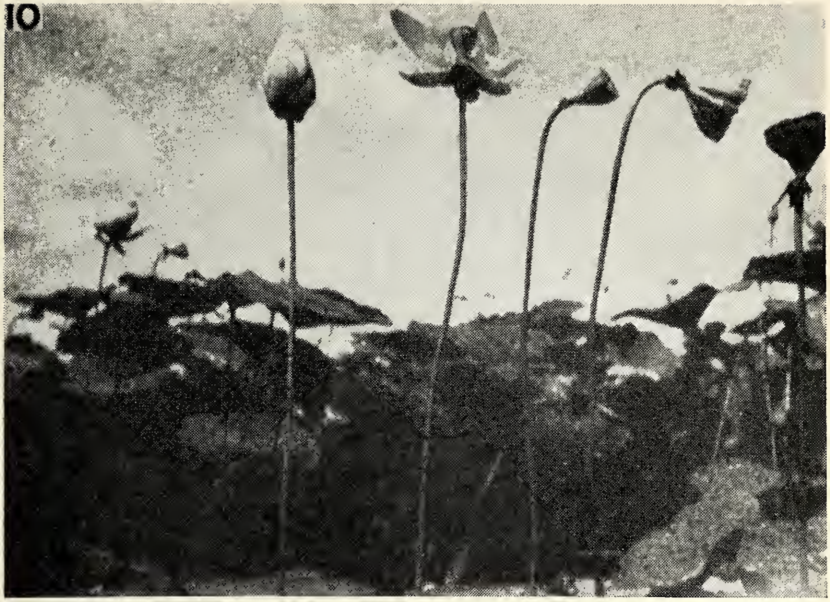
The American Lotus is valueless for wild life and extremely destructive to fish.

A single plant is capable in a single summer of forming a circular patch one hundred and sixty feet in diameter. The presence of its large leaves eliminates oxygenation of the water by wave action, blots out light, destroys useful underwater plants and can cause, as the writer has observed in Miller's Lake, a fish kill so severe that walking in a direct line, one agent of the Department of Wild Life and Fisheries was able



THE AMERICAN LOTUS (Nelumbo lutea). This group of plants has been photographed at the time that they are emerging from the water. Later leaves and flowers will float at the surface. Indicated here quite clearly is the way that, because of the completely waxy surface of the plants, any water deposited upon them shows like quick silver. **(Photographed by Penfound.)**

10



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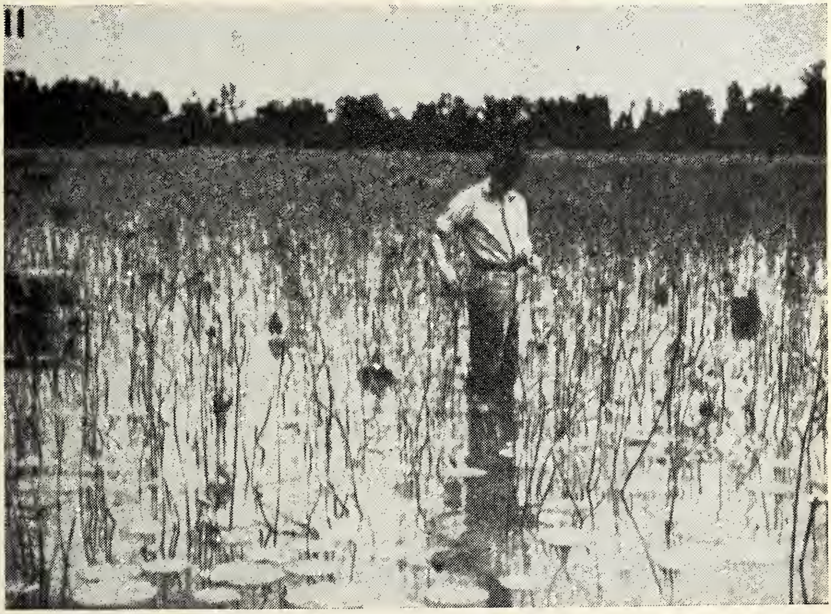
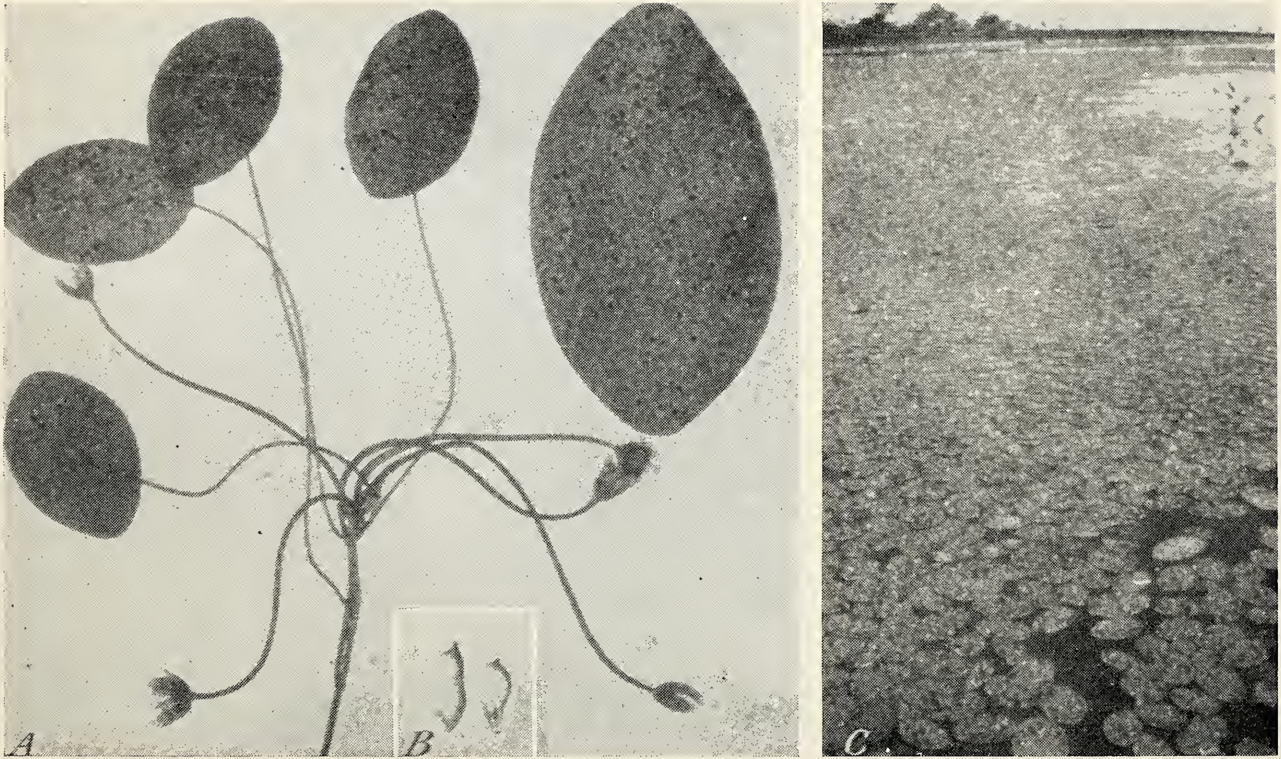
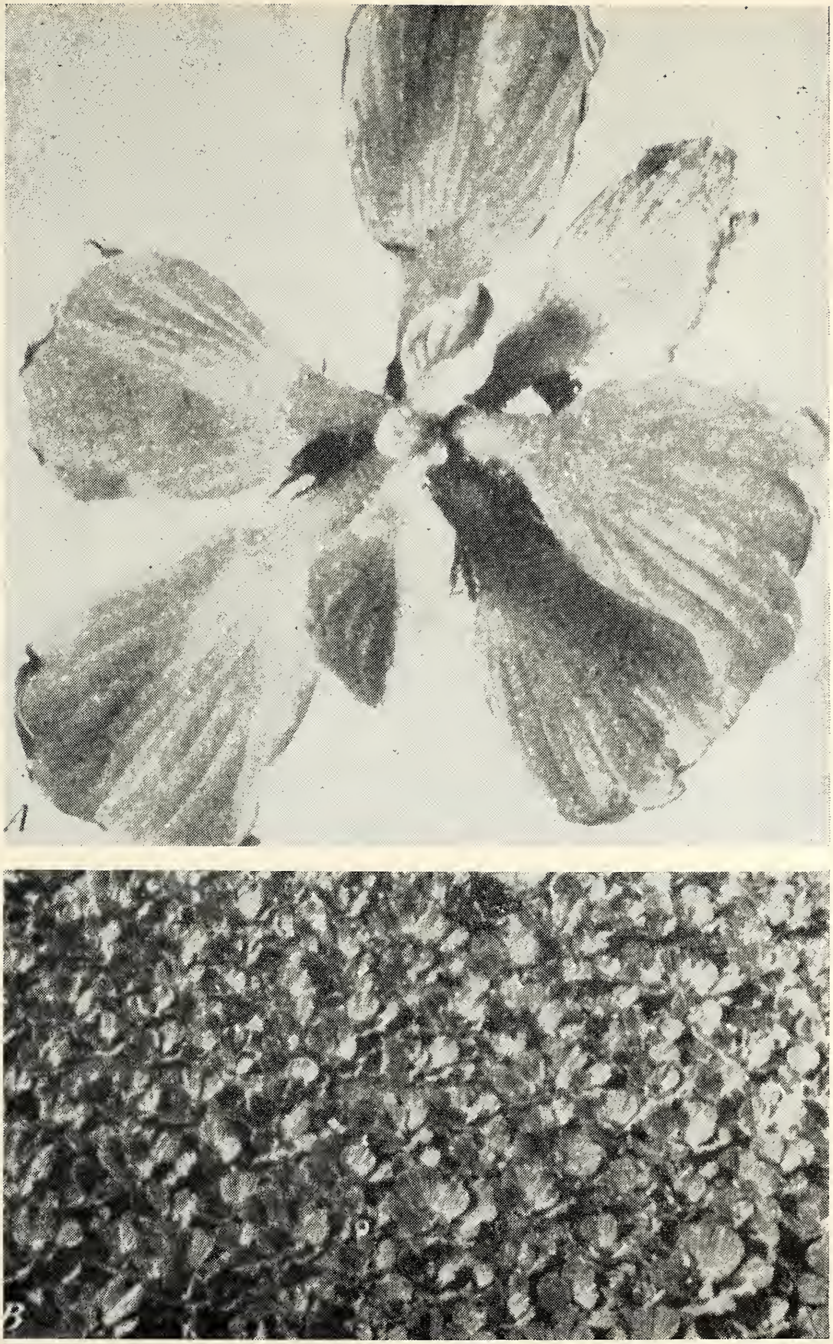


AMERICAN LOTUS (ABOVE) The buds and flowers are erect. Torus turns eastward and down to the horizontal position by early maturity. The torus again erect later falls off.

(Below). Flood waters destroyed leaves and many rhizomes of the lotus. Remaining rhizomes produced a few small leaves of floating type. **(Photographs by Dr. William T. Penfound.)**



THE WATERSHIELD (**BRASENIA**). On the lefthand side is shown the uncleft floating appearance of **Brasenia.** The peculiarly useful duck food that **Brasenia** produces is marked B. Characteristic appearance of **Brasenia** spreads here over a lake. **(After Martin and Uhler).**



WATERLETTUCE The upper illustration shows the structure of "Waterlettuce" and the lower illustration indicates the appearance of this plant when it invades and completely overwhelms many other plants. It is easily controlled by modern chemical methods. **(After Martin and Uhler.)**

to count nine hundred and ninety-seven dead fish in a line equal to two city blocks. The dying fish were starved for oxygen and when placed elsewhere quickly recovered.

Chemical examination showed no dissolved oxygen present whereas subsequent chemical examination in the same area in the early winter when the American Lotus had died and disintegrated actually revealed "super saturation" of oxygen.

The accompanying illustrations show the effects of drawdown on Miller's Lake.

This drawdown effectively controlled both *Brasenia* and *Cabomba* but failed to control American Lotus.

The use of an underwater weed cutter three successive times (at short intervals), before the Lotus actually came into seed production, starved out and completely destroyed thirty acres of this pest.

Subsequently, tests with easily available, easily applied, inexpensive, harmless chemicals proved to be one hundred per cent effective in eliminating American Lotus.

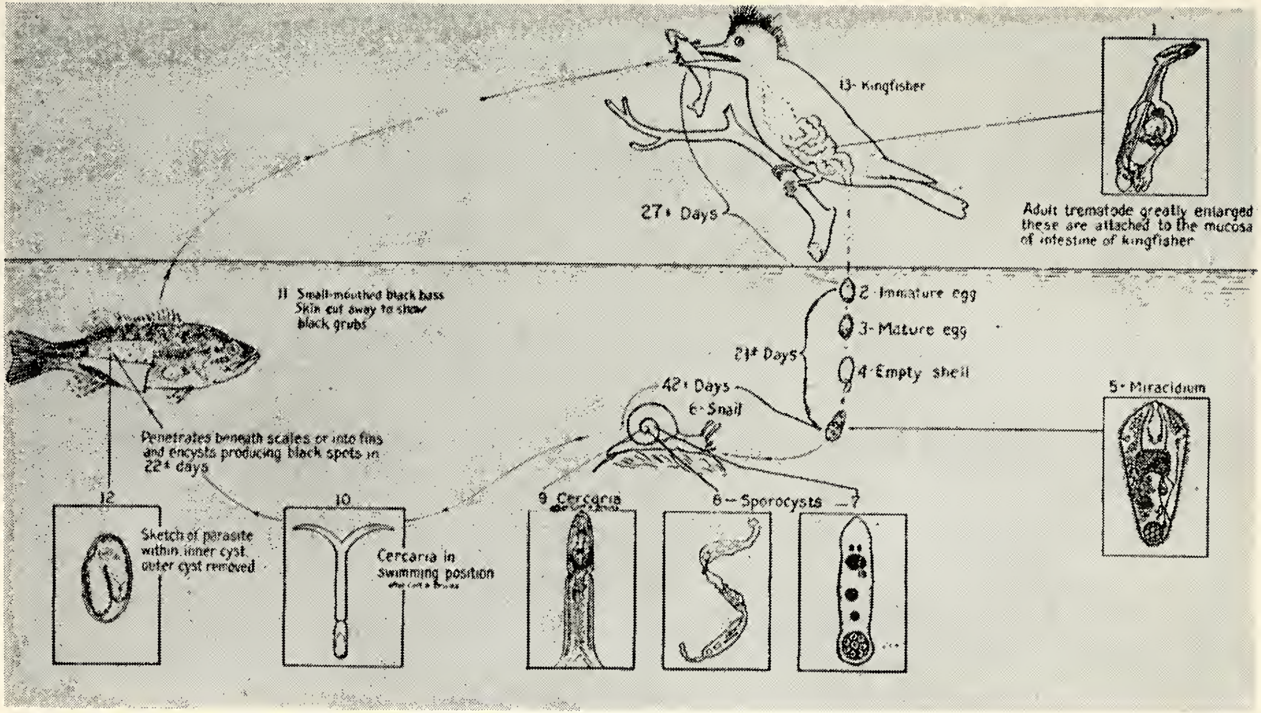
It must be emphasized that the winter drawdown technique must not be used in lakes infested with Water Hyacinth since such drying out of areas of the lake bottom stimulates the growth of enormous numbers of Water Hyacinth seeds which if left submerged apparently would not germinate easily.

Predator Control

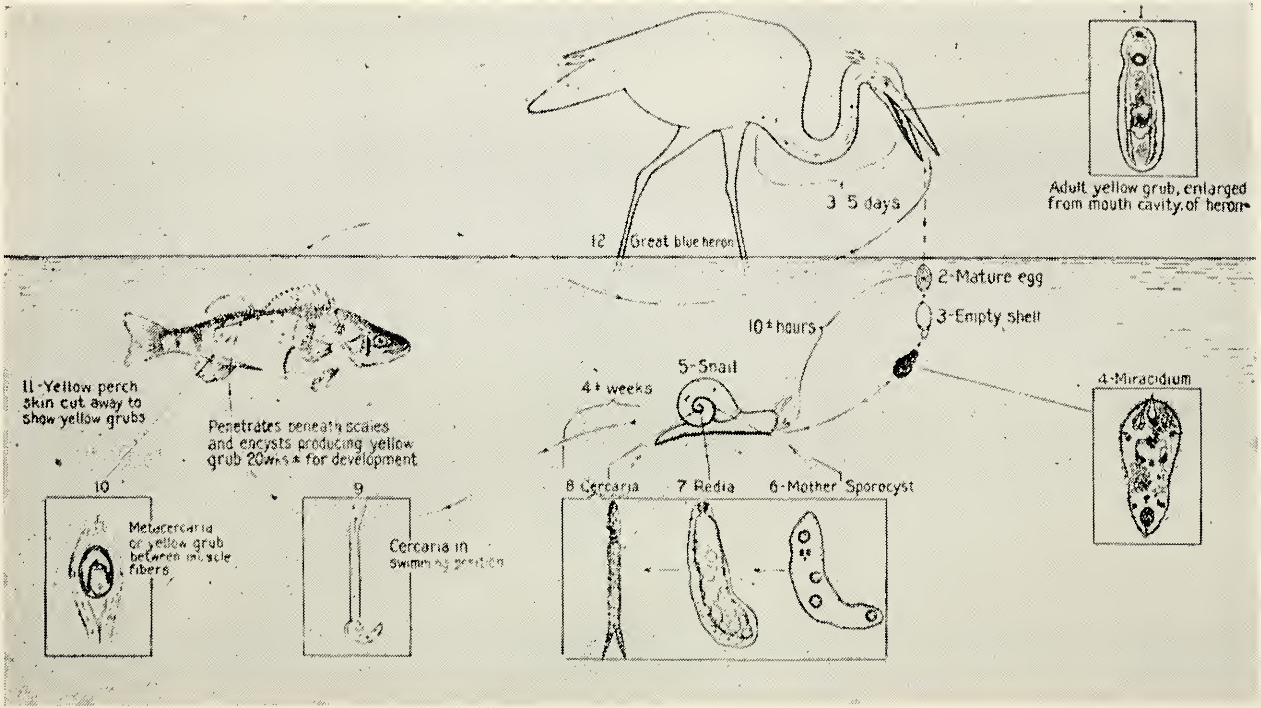
Predator control is another important factor in lake management. This includes the removal of coarse fish under properly supervised operations, the control, where possible, of gars and the persistent long range control of turtles. A desirable, cheap, effective turtle trap is described and illustrated in this report. Water snakes of a number of species (abundant in Louisiana) should be killed whenever possible.

Parasites

The presence of parasites in game fish brings a flood of inquiries to the Chief Biologist.


1
13- Kingfisher
Adult trematode greatly enlarged these are attached to the mucosa of intestine of kingfisher
27+ Days
2 Immature egg
3- Mature egg
4 Empty shell
21± Days
42+ Days
6- Snail
5- Miracidium
11 Small-mouthed black bass Skin cut away to show black grubs
Penetrates beneath scales or into fins and encysts producing black spots in 22+ days
12
Sketch of parasite within inner cyst, outer cyst removed
10
Cercaria in swimming position
9 Cercaria
8 — Sporocysts — 7

"BLACK GRUB" OF LARGEMOUTH BLACK BASS This diagram shows the extraordinarily strange history of the "Black Grub." It appears in the flesh of the Largemouth Black Bass ("Green Trout"). There is no way whereby any agency can control this particular parasite, objectionable though it is. The Kingfisher that provides one essential phase of the life history is protected by State and Federal laws. **(After Hunter.)**


1
Adult yellow grub, enlarged from mouth cavity of heron
3 5 days
12
Great blue heron
2-Mature egg
3-Empty shell
10± hours
4-Miracidium
5-Snail
4± weeks
6-Mother Sporocyst
7 Redia
8 Cercaria
11-Yellow perch skin cut away to show yellow grubs
Penetrates beneath scales and encysts producing yellow grub 20wks± for development
10
Metacercaria of yellow grub between muscle fibers
9
Cercaria in swimming position

"YELLOW GRUB" OF LARGEMOUTH BLACK BASS. This indicates the complex life history of the "Yellow Grub" that disturbs many people who catch Largemouth Black Bass ("Green Trout"). It must be indicated that the Great Blue Heron is protected by both the State and Federal laws. **(After Hunter.)**

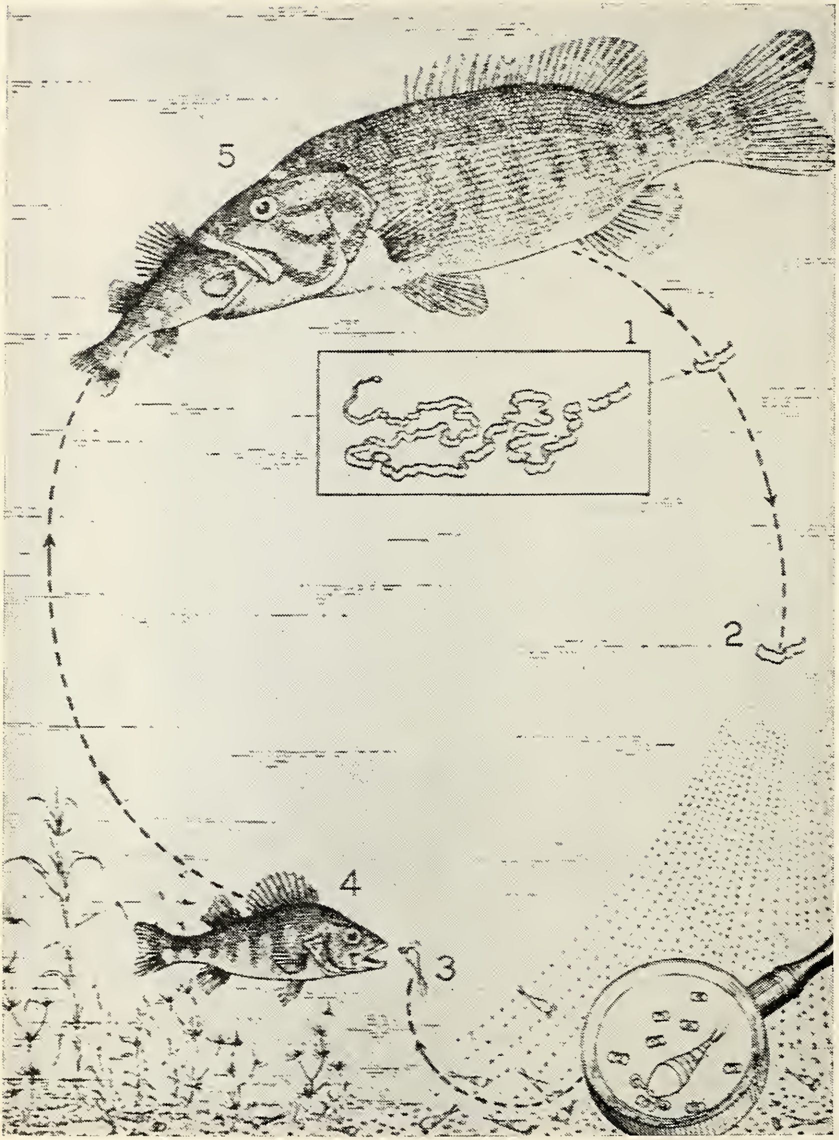
It is desirable to state here that no fish parasite, that occurs in Louisiana, is capable of infesting man. The only North American fish parasite that can live in human beings is a species of tapeworm, that was imported into the United States from Scandinavia by accident, in North America, and occurs only in fishes living at or above the latitude of the Great Lakes.

Most frequent complaints about fish parasites concern the presence of black, yellow, red or white cysts in the flesh of fish immediately under the skin. These structures are actually stages in the life history of four highly different kinds of fish pests. They have extremely complicated life histories, two of which are herewith illustrated.

The black "grubs" have passed during their life history through complicated developmental stages and are actually a form of flatworm known as *Trematodes*. Their black color is due to the deposition around the encysted organism in the flesh of a colored pigment produced by the host fish. When this fish is eaten by a fish eating bird or mammal, the parasites are digested out and proceed to mature in the intestine of the bird or mammal that has eaten them. The eggs they produce pass out into the water to form microscopic worm-like structures and penetrate the bodies of certain species of snails, where they produce still another type of microscopic stage, shown in the illustration, in which stage they penetrate fish or other animals, burrow beneath the scales or into the deeper layers of muscle and there come again to form the black cysts which fishermen find so objectionable.

It must be emphasized that kingfishes, herons and other birds which may form intermediate hosts are protected by State and Federal law and must not be shot.

The yellow grub follows a comparable life history except that in this case it reaches maturity, oddly enough, in the lining of the mouth of the bird that serves as host. The accompanying diagram shows the life history and the number of days the parasite occupies in completing all of its stages. The white grub, which commonly appear in the liver of the fish they infest, is a dangerous enemy of such fish since by their almost complete destruction of the liver of the host, they can cause death. They likewise pass through a fish, a bird and a snail, but



LARVAL TAPEWORM OF LARGEMOUTH BLACK BASS. This common parasite of the Largemouth Black Bass ("Green Trout") is to human beings a completely harmless parasite. The extra ordinary life history of this animal is shown in the accompanying illustration which clearly reveals that its life cycle includes a minute "water flea." **(After Hunter.)**

in their adult form are much more destructive than the black grub.

The red grubs are actually parasitic forms of another group of "worms", the round worms. These live in fish and unless the fish is eaten and digested, these larval stages die. If these red round worm parasites are dissected out in water, it will be immdiately noted that they uncurl themselves and become tiny wriggling worms.

It must be again emphasized that no harm to human beings is possible from these parasites even if they were swallowed in the living condition.

It is unfortunate but true that no general control measures can be used to suppress these objectionable "fish grubs."

Their abundant appearance at certain times and in certain places as contrasted with their scarcity elsewhere and at other times appears to be due in part at least to two things, i.e., the temperature and stagnation of the water in which the fish live. High temperatures and stagnant water evidently create conditions favorable for rapid parasite increases.

Certain lowly crustacea (highly modified water fleas) are sometimes found on the skin of fish where they are capable of moving about and sucking the blood of their host. Known as "fish lice," they can sometimes emacite the fish by their blood sucking activities but they are not usually, in Louisiana, of much importance and can in large measure be disregarded.

The writer will be glad to provide information concerning these parasites but any study of them can only be made if samples of the parasite in the flesh, preserved in a solution of one part water to nine parts of formaldehyde together with sufficient parts of the host fish so that the fish can be identified be sent to the Chief Biologist.

Creel Census Technique in State Parks

It is very necessary that knowledge can be gained of the relation between the number of fish produced in a lake and the number of fishermen who capture these fish. One of the best methods for this procedure is the application of what is known as a "creel census."

The writer as Chairman of the Biological Advisory Committee of the State Parks Commission suggested the application of this technique to Lake Chicot.

This work was done under the immediate supervision of Dr. Walter Moore, Professor of Zoology, Loyola University, New Orleans, who is a member of that Committee. Lake Chicot is particularly useful for that purpose since the fishermen must enter this park area and fish the 2000 acre artificial lake through only two park gateways and from only two boat landings.

Furthermore, Lake Chicot is peculiarly fortunate in never having been invaded by Water Hyacinth or Alligator Weed. A strict boat inspection was recommended by the Biological Committee and carried out by the park authorities so that after a period of several years' studies, this lake still remains free of these two worst Louisiana plant pests in spite of the fact that the persons who fish the lake frequently come over from the heavily infested Miller's Lake and often bring with them either or both Water Hyacinth and Alligator Weed. The unlimited and invaluable cooperation of William W. Wells, Executive Secretary of the State Parks Commission has made possible the conduct of highly interesting and productive work.

It is the recommendation of the writer that these researches as soon as possible be extended to other State Park lakes for the reason that under State control, the lakes provide matchless experimental areas and, furthermore, the information there gained is of definite personal interest to any fisherman in Louisiana whether he is fishing his own farm pond, own lake or in State or other public waters.

Dr. Moore sets down this opinion in the following words and there are here given the report forms.

It should be noted that although this work was begun during the previous biennium, the results were not available until the period covered by the present biennial report. The success of this scientifically useful conservation program can only be obtained through the cooperation of the sportsmen themselves.

Lake Management

"An aspect of lake management procedure which has received too little attention in the past, particularly in southern waters, is the measurement of fishing intensity and the relationship of catch to fishing effort. Usually the only criteria available to judge the fishing conditions in a lake or stream are the praises or complaints of fishermen. These are seldom sufficiently accurate to serve as a basis for lake management practice. When the fishing falls off in a given lake it may be because more anglers are fishing it and the available crop of fish is being harvested by a larger number of fishermen. It should be remembered that the basic productivity of a lake is not changed unless natural conditions change considerably; a given lake will only produce a certain number of pounds of fish per acre. The aim of lake management procedure is to promote the full development of the potential crop of desirable fish under conditions which will permit maximum utilization of the crop by fishermen.

"As the first step in such a program, accurate knowledge concerning the quantity and nature of the fish population of a lake is essential. In October, 1947 a creel census study designed to provide at least some of this essential information was put into effect at Lake Chicot. The immediate aims of the program were to provide data on the number of fishermen, the total number of fish caught of each of the major game species, the amount of fishing effort required to catch the fish, and the seasonal trends in fishing practice.

"Lake Chicot provides very nearly ideal conditions for the pursuance of such a survey. Virtually all fishermen dock at one of the two public boat landings, making it possible to readily contact a large percentage of them. Participation in the survey by fishermen has been purely voluntary and it is gratifying that so large a proportion of them have cooperated by recording the results of their fishing trips.

"One member of each fishing party is asked to fill out a form (here illustrated) on which is recorded the number of fishermen in the party, the approximate duration of the fishing period, the number of fish caught of each species, and certain other data relating to fishing procedures, bait used, etc. Obviously, the validity of the data obtained depends not only on the accuracy of the individual reports but also upon the securing of records from as large a proportion of the total number of fishermen as possible, including those who make no catch at all. State Park personnel in charge of the field work have given encouraging reports on these counts.

CREEL CENSUS — LOUISIANA STATE PARKS COMMISSION

Lake____________________ Parish____________________

Date____________________ No. Fishermen in Party____________________

Fishing period: From approximately____________________(AM) (PM)

To approximately____________________(AM) (PM)

SPECIES CAUGHT	NUMBER	AV. LENGTH	AV. WT.
L.M. Black Bass			
Crappie			
Bream			
Catfish			

CHECK ONE

Still Fishing ☐
Casting ☐
__________ ☐

BAIT

Worms ☐
Minnows ☐
Plug ☐
Artificial Fly ☐
__________ ☐

Name____________________

Address____________________

Form used for Fishermen's Creel Census report.

SUMMARY—CREEL CENSUS

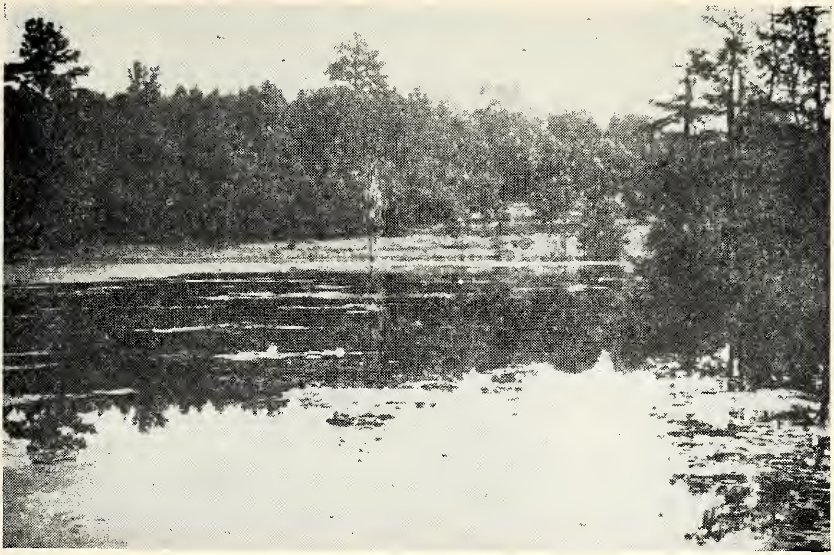
Date	No. Fish-ermen	Hrs. Fishing	Hrs. Fishing Effort	No. Bass Caught	No. Crappie Caught	No. Bream Caught	No. Catfish Caught	Total No. Fish	Fish Per Hour

Form used for tabulation report on Creel Census.

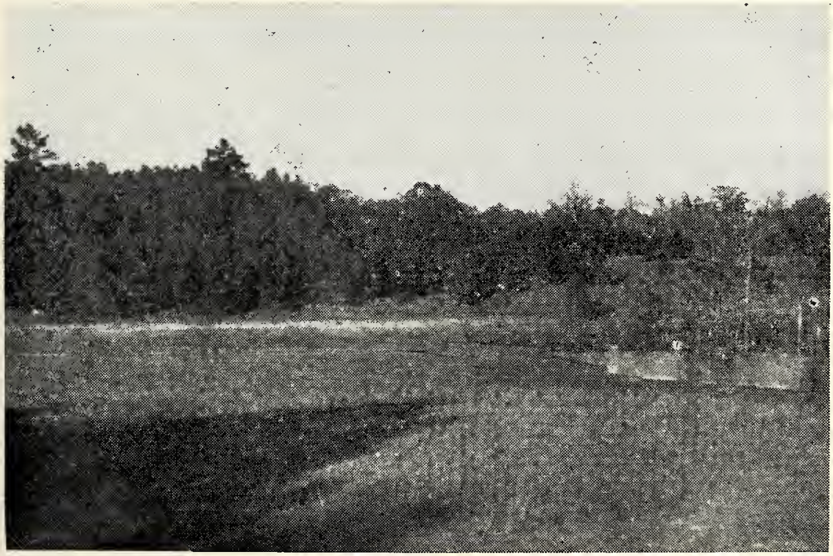
CREEL CENSUS SUMMARIES

Lake Chicot

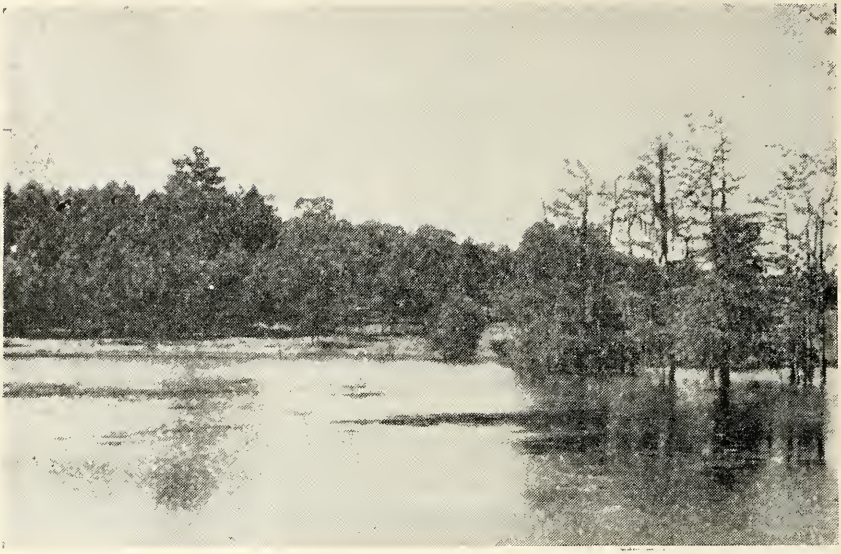
		Oct. 10-31 1947	Nov. 1947	Dec. 1947	Jan. 1948	Feb. 1948	Mar. 1948	Apr. 1948	May 1948	June 1948	July 1948	Aug. 1948	Sept. 1948	Oct. 1948	Nov. 1948	Dec. 1948
No. of fishermen reporting catches...		195	62	No Reports	25	71	1,502	835	419	92	16	20	13	2	No Reports	36
Species Catch Reported by Above Fishermen	Bass ..	568	145		118	105	1,211	592	318	76	27	18	4	10		25
	Crappie.	67	25		3	361	8,562	5,584	2,488	344	63	54	30	8		9
	Bream .	234	49		0	10	1,647	2,971	2,664	704	191	87	80	0		0
	Catfish .	2	3		0	21	72	20	17	22	0	10	0	0		14
Total catch reported by above fishermen		871	222		121	497	11,491	9,167	5,487	1,146	281	169	114	18		48
No. of above fishermen who reported fishing period		130	17		21	58	1,306	691	345	72	16	17	13	2		36
No. hrs. fishing effort reported		631	101		87	301	6,192	3,594	1,799	354	50	71	38	8		237
Total catch made by fishermen reporting fishing period		670	39		111	378	9,999	7,730	4,554	886	281	153	114	18		48
No. fish per hour of fishing effort		1.05	0.39		1.3	1.2	1.61	2.14	2.53	2.50	5.62	2.16	3.00	2.25		0.20



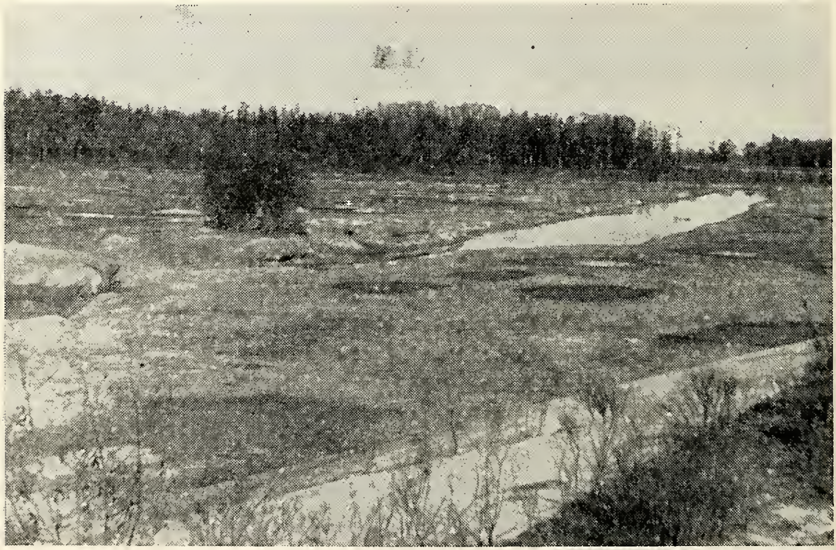
BEFORE TREATMENT 1. Lake Chicot in front of Experiment Station before "drawdown" treatment. Note "water weeds" present in such abundance that fishing is impossible. Plants concentrated are chiefly Brasenia. **(Photograph by Dr. Walter G. Moore).**



DURING TREATMENT 2. Same view at period of great winter drawdown. Note mud flats at left side of picture, which are ordinarily under five feet or more of water. **(Photograph by Dr. Walter G. Moore).**



AFTER TREATMENT 3. Same view during summer following winter drawdown. Note the almost complete absence of water weeds. Drawdown has not only eliminated the weeds for the spring and summer fishing seasons, but has retarded the subsequent growth until at least late summer. **(Photograph by Dr. Walter G. Moore).**



CHICOT LAKE. SPILLWAY END AT WINTER DRAWDOWN. 4. Chicot Lake bed viewed from the spillway. This at time of winter drawdown. Lake is reduced to old stream bed. The cypress stump covered mud flats exposed surrounding the remaining water under normal summer conditions are under five to six feet of water and before treatment was heavily infested with undesirable plants. **(Photograph by Dr. Walter G. Moore).**

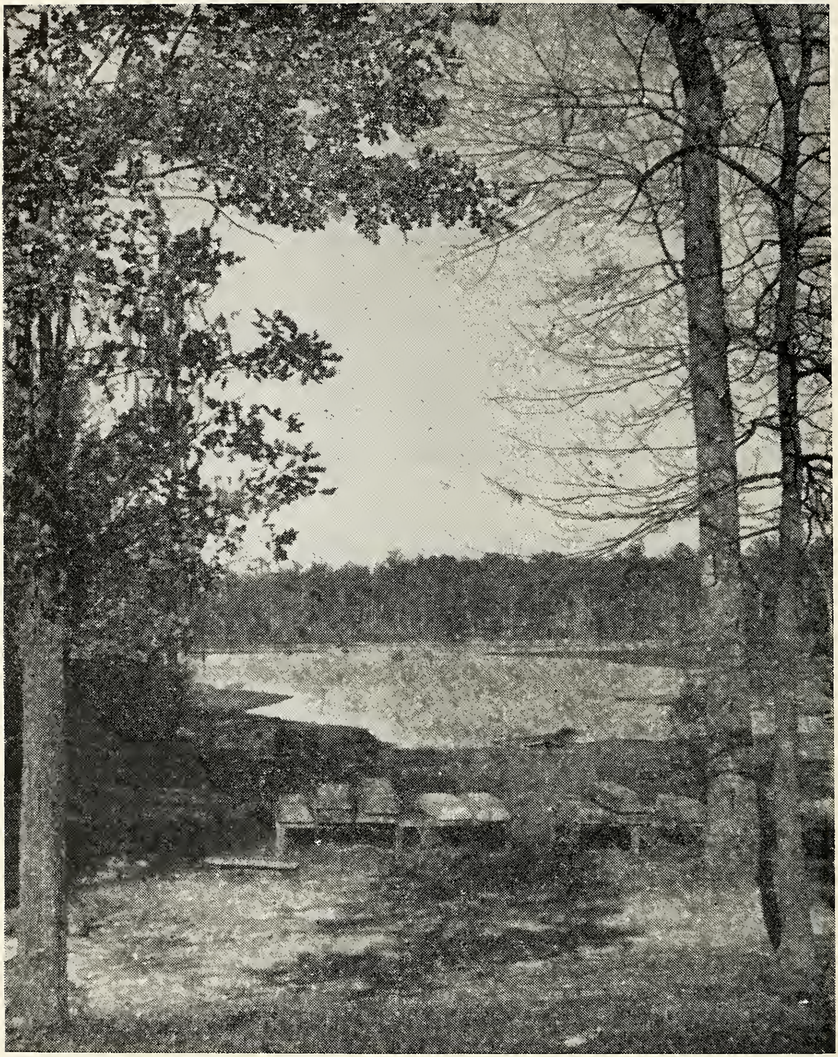
"The data collected to date are, as yet, too incomplete to serve as a basis for generalization. However, the creel census survey promises to provide much basic information needed for the lake management program, particularly relating to restocking policies."

Example of a Management Program for a Louisiana Lake

The writer has had the responsibility of investigating many serious Louisiana lake problems and, as already stated, although each problem is a pattern in itself, certain general principles prevail.

The more that such studies can be pursued, the sooner can fishing conditions be improved in the Deep South since so much of such biological work done in the North is actually incapable of application to Louisiana waters. For the purpose of illustration, there follows a brief statement concerning one such investi-

AMERICAN LOTUS AT NORTH BOAT LANDING. 5. The bed of American Lotus at the north boat landing, Lake Chicot. Thirty acres in extent, this pest was eliminated through three successive cutting; using a submerged weed cutter. The depth of American Lotus "Runners" protect it from winter effects of drawdown. Newer chemical methods afford quick control more effective even than the cutting technique. A single American Lotus plant can in one season form a circular patch 160 feet in diameter and destroy fishing. **(Photograph by Dr. Walter G. Moore).**



MAIN BOAT LANDING, WINTER DRAWDOWN 6. Main boat landing, Lake Chicot. Formerly jammed up and rendered almost useless by objectable "water weeds," a winter drawdown of six feet as shown in effect here accomplished the elimination of the vegetation that clogged this waterway. **(Photographed by Dr. Walter G. Moore.)**

gation, a short period study of Cross Lake, located near Shreveport, Louisiana.

Eight miles long, three miles wide in its center, with an area of eleven thousand acres, forty miles of shoreline and an average depth of ten feet with its greatest depth of twenty-seven feet in the principal channel at the Spillway, Cross Lake receives Water from three inlets at its western end and flows through one exit over a control spillway.

Cross Lake supplies the water used by the City of Shreveport.

The presence of fish in a water supply lake is both natural and highly desirable.

The lake is under the strictest control to prevent contamination of any kind and to insure the safety of fishermen using this lake.

One hundred private and public fishing camps occupy its shores. During weekends, the three thousand skiffs on the lake with an average of two fishermen per skiff are one hundred per cent in use. The writer was called upon by the Department of Wild Life and Fisheries to conduct a brief investigation of this lake, which operation was carried out by the writer together with Dr. Alexander D. Bajkov, then a biologist with the Department. The program set down for immediate improvement and subsequent study here follows.

"A" *Immediate Improvement Program*

1. Stocking Hatchery plus Fish Rescue.
2. Electric Screens.
3. Sanctuary Areas.
4. Turtle and Gar Control.
5. Plant Control No Chemicals Used.

"B" *Study Program*

6. Fishing Pressure.
7. Production—Game.
8. Production—Commercial.
9. Creel Census.
10. Species Area Studies.
11. Water Conditions (Hydrography).
12. Fish Food Condition.

Chemical methods, so useful elsewhere, were not available in this lake because of its use as a public water supply. One preliminary note must also be here inserted and that is that sportsmen must not take too seriously the loss of fish (game fish, commercial fish and forage fish) over dams and spillways. Frequently, the writer has been asked to recommend the installation of electric screens, a highly effective device to turn back fish before they cross the electrically screened zone and thus retain them in the lake.

Such a control is highly expensive, a proposed installation in Cross Lake, for example, costing some fifteen thousand dollars.

It is the considered opinion of the writer that although there may be exceptions to this generalization, the expenditure of funds equivalent to the cost of electric screens could much better be spent in the improvement of the lake itself by predator control, by the establishment of sanctuary breeding areas and by other measures, the details of which the writer will gladly furnish upon request.

It might here be inserted that after very considerable experience with the waters of Louisiana, the writer does not believe that any close season on our game fish is either desirable or in any way useful to the sportsmen. An overfished lake is simply overfished and the procedures that would be effective to meet this "fishing pressure" are to a very large degree already known and can be practically applied. Only in the rarest instances has it been possible to demonstrate that a lake is actually overfished in spite of the quite general opinion to the contrary.

There now follows a list of the fish observed in Cross Lake during this brief scientific investigation since Cross Lake is in many ways a typical Louisiana lake.

Appended to this list is a brief statement of results secured by the study of the relation between age, length and weight of eight fish species of sport or commercial interest in this lake. The ages of fish even in southern waters can be readily ascertained by the microscopic examination of their scales which like the "rings" of a cross section of a tree reveal "check marks" which indicate winter periods when growth has been slowed down.

List of Fishes Noted in Cross Lake

The following species of fishes were noted in the course of these investigations.

1. Paddlefish, Spoonbill cat *(Polyodon spathula).*

It is an important commercial species elsewhere, chiefly due to its eggs which are used for caviar. A few paddlefish were introduced into Cross Lake a few years ago, and several specimens were secured near the spillway. This fish is a plankton and mud feeder, and is desirable species for Cross Lake.

2. Long nosed gar *(Lepisosteus osseus).*

This species of gar is rare in Cross Lake.

3. Short-nosed gar *(Lepisosteus platostomus).*

Short-nosed gar is the commonest gar in Cross Lake.

4. Alligator gar *(Lepisosteus spathula).*

The alligator gar is the largest and most ferocious of all American freshwater fishes.

Probably the fourth species, Spotted gar *(Lepisosteus productus)* also occurs in Cross Lake.

5. Grindle, Shoupique, Bowfin *(Amia calva).*

The Grindle is a predator and although can give a brief, hard fight it is not very popular among the sportsmen. It is not particularly common in Cross Lake, being restricted to muddy and very sluggish pockets. Several schools of young grindle and one individual (at least sixteen pounds) were observed in Cross Lake.

6. Gizzard Shad, Hickory Shad *(Dorosoma cepedianum).*

This small fish is extremely important as a plankton remover, and a forage fish for the game species. It has been reported to be very abundant in Cross Lake. One small school of this shad was noted near the shore at the beginning of April, 1948. During the winter in 1947-1948, when Cross Lake was frozen, a great number of shad were killed, probably due to the lack of oxygen. This species is very sensitive to changes, in dissolved oxygen and usually dies first. Bottom samples in many parts of the lake, taken in March, 1948, revealed that a great number of partly decomposed shad were present in the lake at that time. Apparently dead shad sink to the bottom during the winter when the temperature of the water is low.

7. Bigmouth Buffalo fish *(Megastomatobus cyprinella).*

The chief commercial species of fish in Cross Lake is the Bigmouth buffalo, which attains a weight of fifty, or more, pounds. It feeds on minute plants and animals and grows more rapidly than any of the other fishes in Cross Lake. The study of scales of a fifty-four pound buffalo revealed that this weight can be attained in fourteen years. The production of buffalo in some lakes reaches nearly a thousand pounds per acre, and naturally they utilize an enormous amount of organic matter which otherwise would be wasted and contaminate the water. The annual catch of buffalo fish in Cross Lake averages one hundred thousand pounds. Occasionally this species can be caught by sportsmen on a baited hook.

8. Smallmouth buffalo *(Ictiobus bubalus).*

The Smallmouth Buffalo is closely related to the previous species, but it never attains a weight of more than twenty pounds. It is also a commercial fish in Cross Lake, and in distribution and habits is very similar to the Bigmouth Buffalo.

9. Quillback *(Carpiodes cyprinus).*

This smallest representative of the group is occasionally taken by commercial fishermen from Cross Lake. It is far less important than the two previous species. The feeding habits of this fish are quite similar to the Smallmouth Buffalo.

10. European Carp *(Cyprinus carpio).*

The appearance, feeding and breeding habits of the European carp resemble those of buffalo fishes. It is a commercial species of some value in Cross Lake, and may attain up to forty pounds in weight. It is occasionally caught by hook and line.

11. Bluntnose minnow *(Hyborhynchus notatus)* and

12. Spot-finned shiner *(Notropis spilopterus).*

These fishes were obtained by seine from Cross Lake. Both of them are common, and represent one of the most valuable of forage fishes. A great deal of their food consists of planktonic algae. It is expected that further studies of Cross Lake will reveal the presence of several other minnows belonging to the same family, some native to the lake and others introduced by anglers when they dump their minnow bucket after fishing.

13. Channel Cat *(Ictalurus lacustris punctatus)*.

The Channel Cat is probably the commonest fish in Cross Lake. The estimated annual catch of this species alone is more than one hundred thousand pounds. The average size is between one and a half pounds and two pounds.

14. Willow Cat *(Ictalurus anguilla)*.

The Willow Cat is also known as Eel Cat, and can be distinguished by its broader and heavier head. It is not as common in Cross Lake as the Channel Cat, the proportion between these two species being approximately 25 to 1.

15. The Yellow Cat *(Pilodictis olivaris)*.

The Yellow Cat is not common in Cross Lake, although specimens as large as twenty pounds have been reported taken from the lake.

16. Bullhead *(Ameiurus nebulosus)*.

The Bullhead is the smallest member of the catfish family. It occurs in Cross Lake in small numbers, inhabiting the shallow parts of the lake, and is occasionally taken by hook and line.

17. The Mud Pickerel *(Esox vermiculatus)*.

This small species seldom reaches a length of over twelve inches, and is rare in Cross Lake.

18. Green Pike *(Esox niger)*.

The Green Pike is somewhat larger than the above species, and grows to a length of thirty inches. Numerous fingerlings, about two inches long, were collected in shallow, weedy places of Cross Lake as early as the first part of April.

19. American Eel *(Anguilla bostonensis)*.

The American Eel is extremely rare, and is the only representative of this family, in Cross Lake.

20. Short-headed Topminnow *(Fundulus dispar)*, and

21. Black-banded Topminnow *(Fundulus notatus)*.

Undoubtedly other representatives of this large Topminnow family, as well as the above named species, also occur in Cross Lake.

22. The Mosquito-fish *(Gambusia affinis).*

The Mosquito-fish is the only representative of this tropical family in Cross Lake. It is very common, and is a viviparous small fish which preys upon the larvae of malaria mosquitoes. They breed at intervals of about thirty days and the young ones can be born at any time. Like the Topminnows, they feed partly on planktonic algae and serve as food for game fishes.

23. White Bass *(Lepibema chrysops).* Barfish

The White Bass is common in Cross Lake, and is known to reach a weight up to three and four pounds. It represents a good game and food fish, and can be taken by trolling, casting or fly-fishing.

24. Yellow Bass *(Morone interrupta).*

The Yellow Bass is a smaller species, which can be distinguished by a more yellow color, and broken black stripes about midway along the sides of the body. It, likewise, is taken by trolling, casting or fly-fishing.

25. Large-mouth Black Bass or "Green Trout" *(Huro salmoides).*

Black Bass, which is of the Sunfish family, is known to Louisiana Sportsmen as "Green Trout", and is a very common fish in Cross Lake. It is an excellent game and food fish, and can be found mostly among lily pads in the numerous pockets, or in wooded parts of the lake, where it frequently reaches a weight of five pounds or more.

26. Small-mouth Black Bass, or Spotted Kentucky Bass *(Micropterus punctulatus).*

The Small-mouth Black Bass was also reported from Cross Lake.

27. White Crappie *(Pomoxis annularis)* known locally as White Perch, and

28. Black Crappie *(Pomoxis sparoides).*

The crappies are common in Cross Lake and must be rated as second in importance after the Large-mouthed Black Bass. They are usually taken on a hook baited with minnows.

A number of other representatives of the Sunfish family, such as

29. Bream *(Lepomis machrochirus)*,

30, 31. at least two Bluegills, or Sunfishes, belonging to the same genus and,

32. Goggle-eye, or Warmouth Bass *(Chaenobryttus gulosus)*, as well as cross-breeds of them, occur in numbers in Cross Lake. There were numerous complaints that large bream were becoming rare. No doubt the oldest and heaviest specimens have been fished out.

33. The Pigmy Sunfish *(Elassoma zonatum)*.

This species is the smallest of all American fishes. It is a beautiful one-inch representative of the sunfish family, and was found in the weedy parts of Cross Lake.

34. Skipjack *(Labidesthes sicculus)*.

The Skipjack of the Silverside family occurs in Cross Lake, and reaches a length of from three to four inches. This should not be confused with another Louisiana fish also called the Skipjack which is a close relative of the Shads and is technically named *Pomplokus Chrysockloris*. This latter species is sometimes locally abundant in Louisiana, looks like a miniature (15 inch) Tarpon and can provide good sport on a light rod.

35. Glassy Minnow *(Menidia audens)*.

These minnows are abundant in Cross Lake. Both the Glassy Minnow and the Skipjack are plankton feeders. The Glassy Minnow matures at the age of one year and dies after the first spawning. It has a tremendous economic importance as a plankton remover and as food for game fishes.

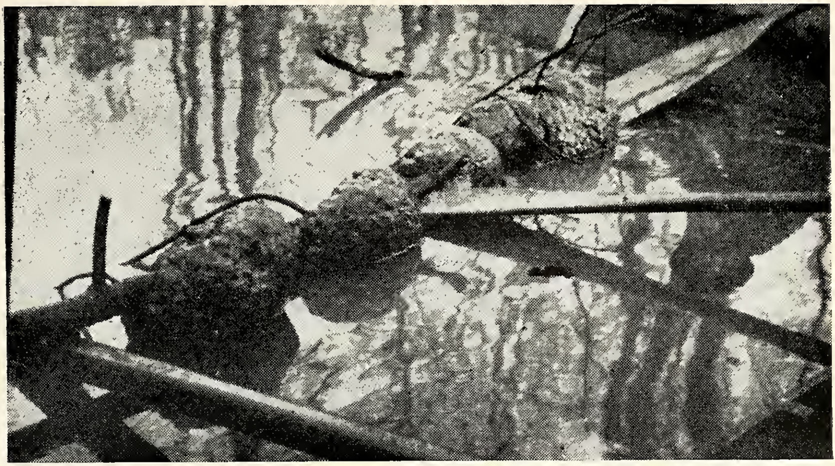
36. Fresh-water Sheepshead or Gaspergou *(Aplodinotus grunniens)*.

The Fresh-Water Sheepshead, although fairly common, is not abundant in Cross Lake. It attains a weight of twenty or more pounds, and is often taken by both commercial and sports fishermen. The flesh is considered excellent.

Rate of Growth

The following is a short summary of the rates of growth of several principal species of fishes listed above. The specimens studied were taken during this investigation.

Age in Years	Length in Inches	Weight in Pounds
1. Big-mouth Buffalo—		
4	23″	8 lbs.
7	30″	15 ”
9	31″	18 ”
9	31″	17 ”
12	36″	47 ”
14	37″	50 ”
14	40″	54 ”
2. Quillback—		
4	19″	5 ”
4	19″	5 ”
4	18″	4½ ”
3. Sheepshead—		
4	16″	2 ”
5	16″	2 ”
4. Large-mouth Black Bass—“Green Trout”—		
1	6″	⅓ ”
2	12″	1 ”
3	14″	1¾ ”
4	17″	2½ ”
5	19″	3¼ ”
6	21″	4½ ”
5. White Bass or “Barfish” *(Lepibema chrysops)*—		
1	9″	¼ ”
2	10″	½ ”
3	11½″	1 ”
5	14″	1½ ”
6	15½″	2 ”
6. Yellow Bass *(Morone interrupta)*—		
2	10½″	½ ”
7. White Crappie or “White Perch”—		
2	8″	¼ ”
3	11½″	1 ”
4	14″	1¾ ”
5	16″	2½ ”
8. Grindle, Bowfin or “Choupique” *(Amia calva)*—		
2	24″	4½ ”



LOWLY ANIMAL MISTAKEN FOR "FISH EGGS" **Pectinatella magnifica** a lowly colonial fresh water animal common in Louisiana lakes and popularly but erroneously thought by fishermen to be massive aggregations of fish eggs. Actually, it is a harmless organism of no economic significance, good or bad. It belongs to a primitive animal group, the **Bryozoa.** **(Photographed by Dr. Walter G. Moore.)**

"Egg Masses"

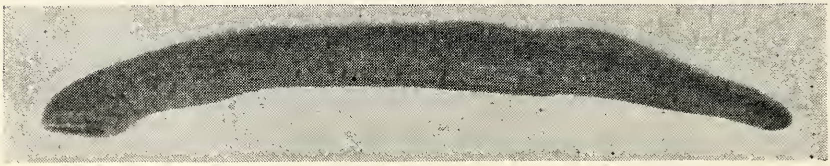
Pectinatella, mistaken for fish egg masses.

A very frequent inquiry addressed to the Chief Biologist is that seeking information concerning massive, usually almost globular, jelly-like structures found attached to sunken logs in fishing waters. Sometimes as large as a washtub, these peculiar bodies are transparent except for the presence of vast numbers of small, black structures scattered through the jelly and each actually representing a single individual.

Fishermen usually mistake these peculiar colonial animals as masses of fish eggs or else believe they may be some form harmful to game fish.

The technical name of this creature is *Pectinatella magnifica* and it belongs to a lowly group of animals that occur both in fresh water and salt water but many of which, unlike *Pectinatella,* are solitary rather than colonial, and may measure individually as little as one twenty-fifth of an inch in length. *Pectinatella* is particularly spectacular following the recession of flood waters. The writer has seen hundreds of these colonial masses hanging from the under surface of a previously submerged bridge where their prominence and abundance aroused the alarm of fishermen. The accompanying photograph, which can be scaled by the boat and the oars, shows four such *Pectinatella* colonies attached to a single submerged log in Lake Chicot.

Pectinatella forms very peculiar winter cysts known as statoblasts, spherical, black in color and with about a score of peculiar stalked anchors, which float and by accidental attachment to fishes and other animals become carried to other areas.



SILVER LAMPREY. Of particular interest to both the sports fishermen and commercial fishermen are the lampreys. A specimen submitted to the writer was taken near Alexandria, Louisiana, attached to a largemouth Black Bass ("Green Trout"). The technical name of this particular species, which is called the Silver Lamprey, is **Ichthyomyzon concolor.** Lampreys are extraordinary primitive fishes which possess no jaws whatever, but instead of which exhibit a peculiar circular rasp-like mouth. Not only do they lack jaws but also they possess no paired fins which are so typical of the higher fishes. Lampreys are of peculiar interest because one marine species has within recent years invaded and utterly destroyed the valuable commercial fisheries of certain of the Great Lakes in Northern United States. Fortunately, this particular lamprey, called the Sea Lamprey, Lake Lamprey or Stone Sucker, to quote the latest authority, "Is not known from the Gulf of Mexico nor from the drainage area of the latter."

Lampreys are completely parasitic upon other fishes, both game and commercial, boring their way into the fish and often eating their victim out until only the skin remains.

The Chief Biologist would appreciate receiving any specimens of lamphey since such records are of scientific interest and, quite apart from their curious structure, the invasion of our fishing areas by the dangerous salt water species might conceivably be disastrous.

Lampreys in Louisiana are confused popularly with completely different animals which are not fishes at all but are actually tailed amphibians which are fresh water and commonly found in ditches. They are harmless forms of a number of different species that because of their appearance nevertheless often evoke terror when they are discovered. **(After Eddy and Surber.)**

Lamprey

A specimen of unusual interest sent in from Alexandria is here reported because of the unusual formation of this fish. It is a specimen of one of the number of species of primitive fishes known as Lampreys. It must be pointed out that the term Lamprey in Louisiana is most frequently applied, not to a fish at all, but to a tailed amphibian, known as the Congo Eel. Lampreys are astonishing animals in that they possess no jaws whatever being provided instead with a strange circular, tooth encrusted, sucker-like mouth.

Lamprey Eels exist as parasites on fishes which they may destroy. Attaching themselves to the external surface of game and commercial fish, they rapidly feed upon their blood and flesh. One species, the Sea Lamprey, *Petromyzon marinus*, has, apparently due to certain canal changes, invaded the great lakes with completely disastrous results. A once vastly profitable fishery has been wiped out within a period of only a few years. Fortunately, our latest available scientific information reveals that this extremely dangerous fish "is not known from the Gulf of Mexico nor from the drainage area" of the Gulf of Mexico.

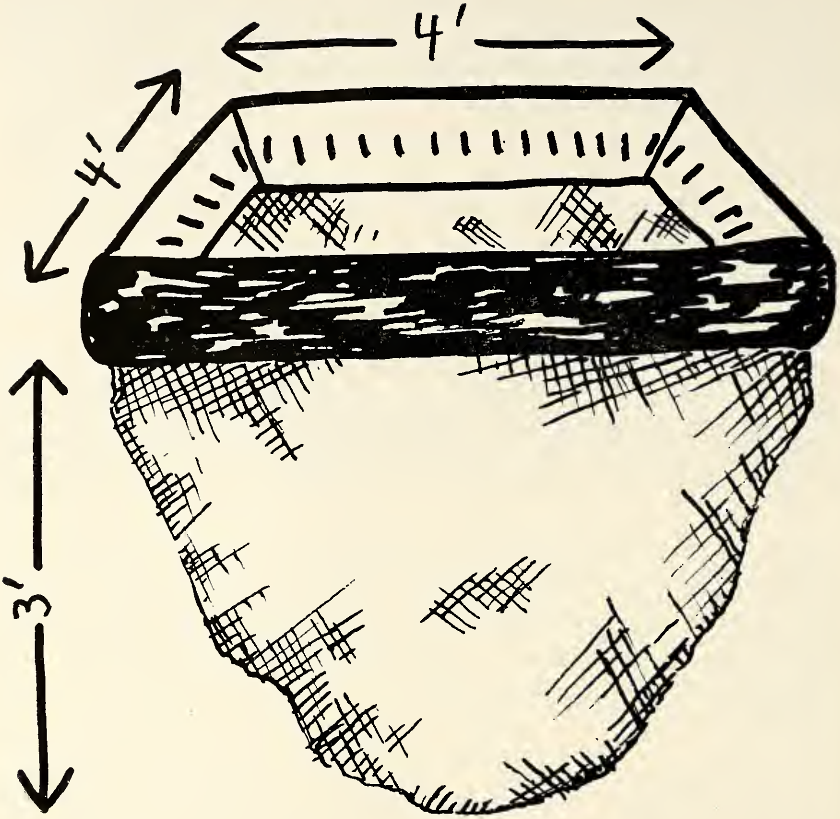
The writer would greatly appreciate receiving any specimens of Lampreys captured by fishermen since the appearance of the dangerous Lamprey species could readily involve terrible damage to Louisiana game and commercial fish. An illustration of the species of Lamprey to which the specimen captured in Alexandria belongs is here given.

Turtle Control

Sport fishermen are interested in ridding their fishing waters of those serious enemies of game fish—turtles. Many kinds of turtle traps have been devised, but the one herein described has the two great advantages of low cost and ease of construction.

Essentially, this trap consists of a square frame composed of split logs from which hangs down a bag made up either of chicken wire or of fish netting. Turtles which climb on the logs fall in and are prevented from climbing out again by a series of long nails which are directed inward. Directions for construction follow:

An eight-foot length of old telephone pole should be sawed into two four-foot lengths, each of which is then split down the middle. Bevel each end of each four-foot length and nail or bolt them together at the corners. The round side of the log must be left on the outside, the flat side on the inside.



INEXPENSIVE TURTLE TRAP. CAN CATCH WATER SNAKES. Anyone can readily construct this turtle trap and, with modifications, make it also a Snake Trap.

Built of simply four 4" lengths of any railroad discarded tie, with a bag made simply of chicken wire, this trap with properly applied nails will serve anyone who possesses a fish pond as an effective conservation device. It should be visited about twice a week and the trapped turtles removed, eaten or destroyed. Some of these turtle species are very fine food and, as a matter of fact, were imported all the way into Louisiana from Michigan. **(Original drawing by Miss Eleanor Fairman, Artist of the Museum of the Department of Wild Life and Fisheries.)**

Four pieces of 1 x 6 lumber are then secured and drilled with small holes at intervals of every two inches. Sixteen penny nails are then inserted into these holes and the lumber nailed to the flat inner surface of each side of the trap so that the nails stand out three inches above the water when the trap is floating.

One-inch poultry wire netting is then tacked to the under side of the frame so that it hangs downward forming a sack about three feet deep.

This trap can then be either set adrift in ponds or fastened to a stake or held by a roped stone as anchor.

A wire container is so fastened that it swings just under the surface of the water near the center of the trap. When the turtles crawl out on the edge of the trap, the odor of the bait attracts them, and once they fall over the projecting nails, which should stand at a level of three or four inches above the water, the turtles cannot climb out.

Bait should be renewed at least every two or three days or it will cease to attract the turtles. If the frame becomes waterlogged, two gallon oil cans, fastened to the sides, will serve to keep the trap properly afloat.

The trap should be visited every couple of days so that the turtles can be removed and destroyed. Such a turtle trap can also be modified in size of mesh and spacing of nails so that it will catch water snakes which are also fish enemies.

This is, as a matter of fact, the only effective snake trap that the writer has ever been able to discover. The ingenious fishermen needs only to remember that a water snake can wriggle through a pretty small space and must, therefore, correctly modify the size of the mesh of the net and the interval between the nails.

Being continuously set, it is highly efficient in reducing turtle populations in fishing ponds.

Effective use of these traps can best be accomplished when they are visited at least twice a week.

The addition of a couple of outside runways leading up to the edge of the trap will catch many more turtles since, as every fisherman knows, these fish eating turtles are fond of climbing up such slopes to sun themselves and are constantly agitated by later comers so that they plunge over the edge and are captured.

Net Preservatives

The problem of net preservation in the warm waters of the South is one of a most serious character.

Various formulations of tars have been used as well as various formulations of copper salts but each of these classes of preservative processes possesses certain distinctly objectionable attributes, some of these tars causing the "burning" of the nets, while some of the copper oleate and other copper formulations dissolve out too readily from the net fibers.

Through the cooperation of Mr. F. P. Stubbs of New Orleans, representing the Island Trading Company, Ltd., of Borneo, the Chief Biologist has secured some fifty pounds of one of the most well-known of all net preservative compounds, used for many centuries in the East, and known under the trade name of Cutch. This is extracted from mangrove bark of the Orient, the South American mangrove derivatives not being of at all equal value. This shipment was made to the writer from Borneo by way of Hong Kong and San Francisco.

The Japanese, during the war, destroyed all of the installations where this substance was produced there. It is just now again appearing on the market.

The Chief Biologist has set up a series of test experiments at the Department of Wild Life and Fisheries Biological Station at Sister Lake, where the efficiency and duration of protection (presumed to be six months) of Cutch will be ascertained.

The information obtained will be made freely available to all fishermen or other persons interested.

Shrimp

The shrimp fishery remains greatly the most valuable fishery of the entire South, to which Louisiana still contributes probably seventy-five per cent of the entire national catch. The second fishery in value in the Gulf States is the rather localized sponge fishery whose activities center at Tampa on the west coast of Florida. Since sponges are at present commercially exploited only in Florida among the Gulf States and since, further, and is a highly specialized interest in the expansion of this fishery and its maintenance is at present consequently more or less limited to that State.

It is the purpose of this section of this report briefly to set down some facts concerning the shrimp, both fresh water and salt water, that are commercially used in Louisiana and to provide some description of their characteristics whereby they can be identified even by the layman. Constant inquiries both from commercial enterprises and from interested citizens reveal the need for the dissemination of such information. Also will be given a table whereby shrimp lengths can be translated into shrimp number per pound since the laws governing the taking of shrimp are expressed in the later terms. Also, and more essential, will be indicated the need for a revision of present shrimp seasons so that these seasons will accord with biological facts rather than industrial controversies and can thus afford better conservation measures. There is every reason to believe that unless such adjustments in close seasons are made the shrimp supply produced for the market will continue to decline.

For the purpose of clearness, shrimp may best be discussed as:

The latter being the more important.

1. Fresh water shrimp.
2. Marine shrimp.

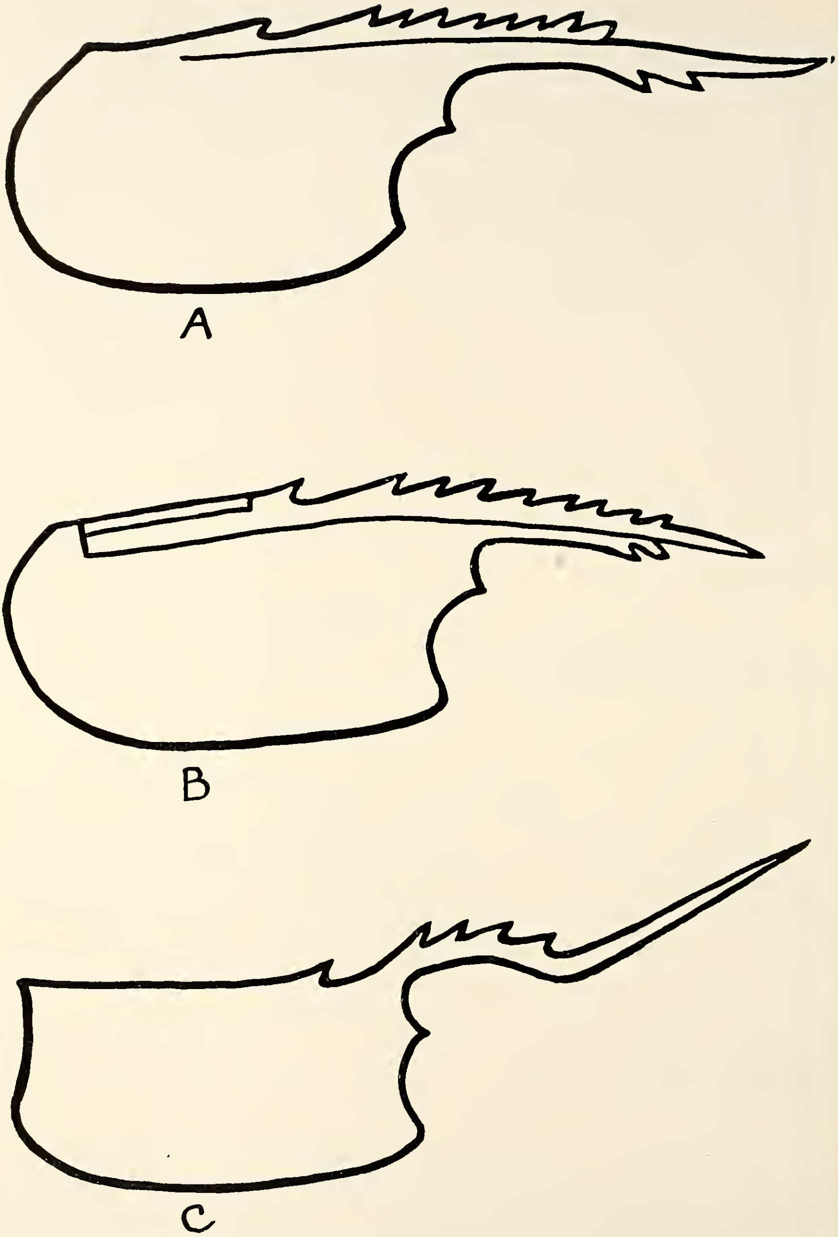
(The latter being the more important.)

Fresh Water Shrimp

The common commercial fresh water shrimp of New Orleans is the River Shrimp, *Macrobrachium ohionis*. This species is usually six to eight inches long (shrimp are measured from the tip of their "head spine," technically rostral spine, to the tip of their ventral, "tail spine", technically telson) and lives entirely in fresh water. Rarely in cases of heavy rainfall, it can be swept down into the brackish water in the upper part of Barataria Bay.

Sold Commercially

It is taken and sold commercially in New Orleans and formerly was commercially fished in a small way in the Mississippi River as far north as Illinois. It ranges from North Carolina to Texas. Unlike the more important commercial sea shrimp, the River Shrimp carries its eggs attached to its body until



"HEADS" OF SHRIMP VIEWED FROM THE SIDE. Figure A. (Twice natural size.) The Common "Lake" Shrimp. Groove on each side of the "head" that runs above two-thirds of the way backward.

Figure B. (Natural size.) The Grooved Shrimp (often called incorrectly the Brazilian Shrimp). Groove extends almost to the back edge of the "head."

Figure C. (Three times natural size.) The "Sea Bob" possesses **no** groove and has an upturned frontal spine that lacks barbs on under side.

they hatch. There have been brought to the writer at various times specimens of a greatly larger relative of the River Shrimp, technically known as *Macrobrachium jamaicense,* which ranges from Brazil to Florida and Southern Texas. One specimen brought to the writer, which was taken from Bayou Lafourche south of Houma, measured seventeen inches from tail tip to claw tip. In its normal range, individuals have been known to reach a weight of three and a half pounds. This shrimp naturally arouses great interest whenever it is found in Louisiana and recently proposals have been made to introduce and propagate it in Louisiana waters. Biologically, this does not appear, in the light of our present knowledge, to be a practical enterprise since the species is in the extreme northern limit of its range, and since it is already present here, it would doubtless multiply naturally if conditions were favorable.

The third species of fresh water shrimp encountered by our sportsmen is the glass-like "Grass Shrimp," *Palaemonetes,* only about one and a half inches long and only useful as bait for fishermen.

The salt water shrimp of Louisiana present a complicated problem that is often importantly confusing, since misunderstanding of the identification of these shrimp frequently leads to completely incorrect ideas about shrimp conservation.

Our chief commercial shrimp is commonly called the Lake Shrimp, White Shrimp and common Sea Shrimp, technically *Penaeus setiferus.* It makes up from seventy or more per cent of the eighty to one hundred million pounds of sea shrimp that Louisiana has annually produced. Two characteristics immediately distinguish it.

The "head" of the shrimp, technically known as the cephalothorax, is that part of the shrimp that bears the forward projecting spine and contains the viscera of the shrimp. It is the part removed when the shrimp are "headed" and is characterized by being a shield-like external skeleton consolidated into a single plate. This "head shell" or cephalothorax is the simplest means whereby the most important species of our marine shrimp can be identified.

The second important species of marine shrimp is the so-called "Brazilian Shrimp" or "Brownie," which in spite of popular opinion attains a size as large as that of the Lake Shrimp. The writer has in his collection specimens that weighed exactly a quarter of a pound each. Hereinafter this will be referred to for the sake of clearness as the "Red Grooved Sea Shrimp," technically *Penaeus aztecus.*

Closely related to the Red Grooved Sea Shrimp is a third species hereinafter referred to as the "White Grooved Sea Shrimp," technically *Penaeus duorarum.* This species appears only erratically in any numbers and adds profoundly to the confusion of the fishermen who regard it, because of its white color, as being the young of the Common Sea Shrimp (Lake Shrimp), *Penaeus setiferus.* This is not the case and has in the past led to quite incorrect criticism of the action of the Department of Wild Life and Fisheries when its presence in catches has caused the fishermen to think that undersized Common Sea Shrimp as being destroyed. As far as we know, this White Grooved Sea Shrimp is not of any commercial importance.

Further reference to these kinds of shrimp will be made below.

The Sea Bob

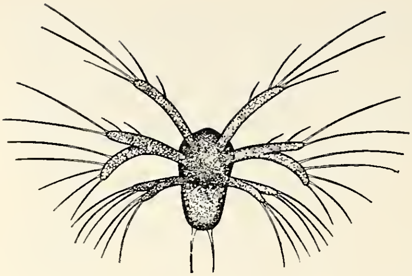
The fourth kind of sea shrimp that is commonly fished is the "Sea Bob," a corruption of the French word "Six Barkes" (six beards). This name is derived from the fact that in addition to long "whiskers" (technically known as antennae and antennules), this species has a pair of elongated legs so that when it is picked up, it hangs suspended by six "beards". The Sea Bob is an erratic shrimp that is taken closely inshore and is too small for canning. It is used by the drying platforms. Identification of the Sea Bob can be instantly made upon examination of the head alone, as indicated below.

Reference should now be made to the accompanying illustration showing the sideviews of the "head shells" of the four commercially utilized sea shrimp. The Common Sea Shrimp has on each side of the mid line of its back a groove that extends from the front edge of the hard shell four-fifths of the way back to the hind edge. In the Red Grooved Sea Shrimp and White Grooved Sea Shrimp both, this line extends completely to the back edge of the "head" and a third groove occurs in the middle upper surface of the head between these grooves. In all three species (Common White Sea Shrimp, Red Grooved Sea Shrimp and White Sea Shrimp), the head spine (rostral spine) projects in a line level with the shrimp's upper surface, whereas in the Sea Bob, this head spine turns sharply upwards, as clearly shown in the diagram. It is, therefore, perfectly possible to distinguish between these two groups by simple touch. This is mentioned because violators of shrimp laws have often absurdly contended that they confused these species and really did not mean to take undersized legally protected shrimp.

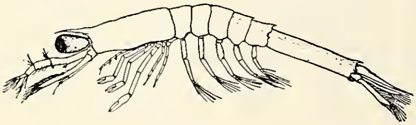
Frequent inquiries are directed to this office by people who have found River Shrimp in market purchases they have made of sea shrimp and have been astonished to find such shrimp bearing eggs. Economically important sea shrimp extrude the eggs into the sea water where they drift and undergo their development in inshore "nursery grounds". River Shrimp carry their eggs attached until they hatch.

A still further and important point of confusion is that there occurs another small sea shrimp of absolutely no economic importance that is frequently mistaken by fishermen and laymen as the young of the Common Sea Shrimp. The technical name of this shrimp is *Acetes*. It has no common name. At times, it occurs in such vast numbers in Louisiana waters that offshore trawling gear or offshore menhaden nets when hauled are found to be covered with these small white shrimp which attain a total length of only three-fifths of an inch. This has led to the most violent controversies because their destruction in such a fashion has been interpreted by many people as damaging our Common Sea Shrimp supply.

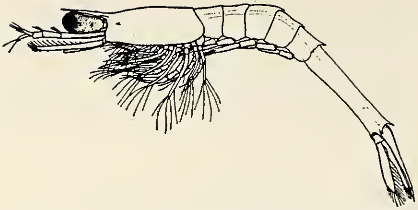
Acetes, unlike the economically important sea shrimp, carries its eggs attached to its body until they hatch. It has been possible for the writer to convince fishermen that these *Acetes* thus destroyed are not young Common Sea Shrimp by showing them specimens under the microscope when it was possible for them to see not only unhatched eggs but the developed young shrimp within those eggs, still unhatched but exhibiting conspicuously developed eyes and other structures. The importance of this cannot be over-emphasized since it has been a major point of attack upon biologically sound shrimp conservation measures.



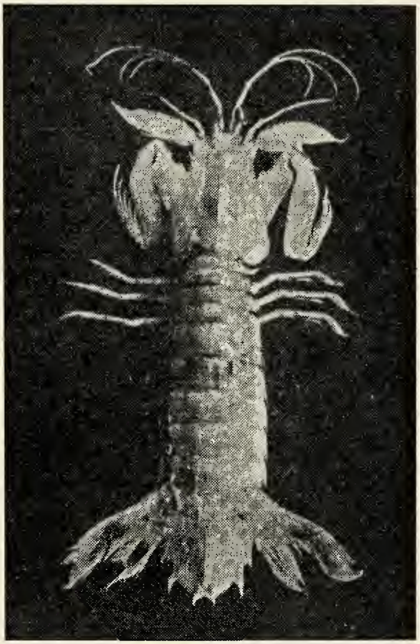
NEW-BORN LAKE SHRIMP. This is a drawing of a newly hatched Common Sea Shrimp (Lake Shrimp) known as the **Cyclops** (one-eyed stage) approximately fifteen hours after the thousands of eggs have been laid. A single female can produce eight hundred thousand eggs. It is transparent and so small that its body measures three one hundred and twenty-fifths of an inch in length and less than two one hundred and twenty-fifths of an inch in greatest body width. **(Drawing by Pearson.)**



THE YOUNG SHRIMP NOW ASSUMES ADULT FORM IN MINIATURE. This is the first stage in the grouth of the Common Sea Shrimp (Lake Shrimp) in which it has concluded its "larval" development and now possesses "walking legs" and for the first time descends to the bottom instead of floating helplessly at the mercy of currents. This growth stage occurs in the shrimp nursery grounds. This youthful shrimp still is only four twenty-fifths of one inch in length. **(Drawing by Pearson.)**



LAST LARVAL STAGE OF LAKE SHRIMP. This is the last "larval" stage of the Common Sea Shrimp (Lake Shrimp) before it acquires its first miniature "walking legs." It now measures only four twenty-fifths of an inch in entire length. **(Drawing by Pearson.)**



"QUEEN SHRIMP" IS NOT A SHRIMP. Though utterly of no economic importance, the crustacean here illustrated arouses much curiosity and is frequently sent in for identification. Popularly known as the "Queen Shrimp" or sometimes the "King Shrimp", they are not closely related to shrimp but belong to another group of crustacea called the **Stomatopoda.** The technical name is **Chloridella empusa.** These peculiar animals live in burrows in the mud but are frequently taken in shrimp trawls and sometimes appear as a part of a purchase of market shrimp.

A great amount of information has been acquired concerning the life history of the Common Sea Shrimp through the activities of the cooperative shrimp investigations conducted by the State of Louisiana together with the Fish and Wildlife Service of the Federal Government and the cooperation of at least one other of the Southern States. The briefest indication of some of the ascertained facts should here be given since the understanding of them will permit legislators to appreciate the biological reasons for recommended shrimp laws.

A Prolific Animal

The Common Sea Shrimp is an extremely prolific animal, a single female being capable of producing in excess of eight hundred thousand eggs. Furthermore, the Common Sea Shrimp has been found to contain ripe eggs throughout the unusually extended period of mid-February to mid-September. Still furthermore, Common Sea Shrimp have been found to breed from shore line to forty or fifty miles offshore. The breeding habits and life history are highly peculiar. The male shrimp transfers to the female shrimp two small structures in the form of gelatinous covered capsules which contain the spermatozoa. These are retained in an external chamber of the female through which, when extruded, the eggs pass and are at that time fertilized. The minute eggs (less than one one-hundredth of an inch in diameter) are clear as glass and about the same density as sea water and, therefore, drift with the tides. They hatch within some fifteen hours into a one-eyed, strange looking young shrimp, only three two hundred and fiftieths of an inch long and two two hundred and fiftieths of an inch wide. Thereafter, this "larval" shrimp undergoes in rapid succession at least nine further extraordinary transformations, until having attained a length of only about one-fifth of an inch, it asumes in miniature for the first time the appearance of its parents and descends to the bottom to feed. It must be indicated that this stage in the life history can be accomplished only in the inshore waters. This is most peculiar but true, most peculiar because these shrimp eggs and early shrimp stages are quite helpless in transporting themselves to the nursery grounds but are simply swept there by tides. The first bottom stage of the shrimp, which resembles the adult in possessing "walking legs" and descending to the bottom to feed, has been found in Louisiana waters off

Southwest Pass and Barataria Pass from the last week in April through the second week in September. The economic importance of this is great since it means that the "brood stocks" of shrimp could not be seriously damaged by even heavy fishing for the adults. The number of shrimp eggs and young shrimp produced is enormous. The factor that limits their growth is the capacity of the nursery grounds.

Three important considerations arise from these facts—first, the desirability of preserving such nursery grounds from pollution; second, from the destruction of the protective bottom vegetation in which the young shrimp grow up; and, third, and most important, the adjustment of close seasons so that the young shrimp will not be destroyed by premature shrimp trawling operations or by shrimp trawling during the winter season when their growth is slowed down because of low water temperature. After the most careful consideration, the recommendation was made by the Chief Biologist that the shrimp be protected during the winter season from December 15th to March 31st when their growth is slowed down, and between June 15th and August 31st when the shrimp are growing very rapidly (as much as one and two-fifths inches in length a month) and correspondingly if harvested later would produce enormously greater volume.

There is no biological reason for the closing of the offshore (beyond the eighteen foot depth line) at any time during the year since we now clearly know that the shrimp brood stock would, even in the face of heavy offshore fishing, be still completely adequate to stock the nursery grounds to their full capacity. This is an essential point since for other reasons there has rapidly been urged such closing of taking of offshore shrimp. It must be repeated that whatever other considerations may exist through factional interests or other reasons, there is no biological basis for such action and the simple result of closing such an offshore fishery would be the failure to harvest an existing crop that would otherwise die without any use whatever being made of it.

Another matter should be brought to attention as of importance in the conservation not only of shrimp but of young game and commercial fish as well. This is the protection of these shallow inshore "nursery grounds" from damage by haul seines or shrimp trawls, which not only destroy the young Common Sea Shrimp, the young of many species of economically important fish, but also so disrupt the nursery ground bottoms that they no longer remain useful for this purpose.

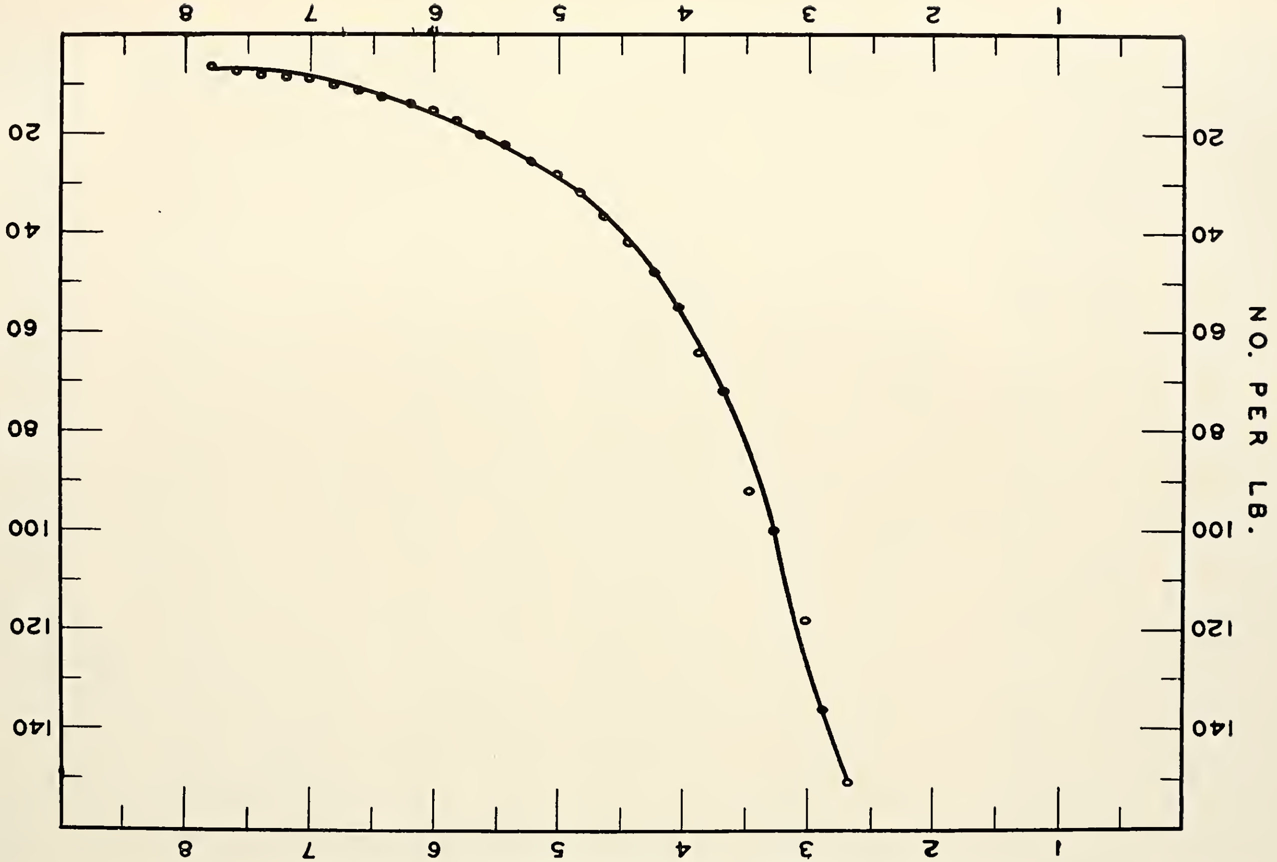
Such protection could be afforded either by the establishment of "sanctuary areas" wherein haul seine and shrimp trawl operations would be prohibited at any time or, if such a result could become acceptable, by the closing of all such inshore nursery areas to such operations at any time of year.

Favor Protection

The Chief Biologist, in presenting this matter at a conference representing all of the Southern States from Maryland to Texas, was surprised to find how much in agreement the biologists and many of the operating fishermen themselves were in favor of such a year 'round protection.

There is every evidence available to indicate that these two broad measures—protection of shrimp during the winter when they grow slowly and during the certain summer period while, though they are still small, they are growing very rapidly, and the second measure of protecting the nursery grounds from damage would do more than any other thing to increase the volume of our shrimp production. The protection of the shrimp nursery grounds must necessarily include careful, long range protection from damage by pollution of all kinds. The idea that the production of shrimp in Louisiana is declining because of the destruction of the brood stock of shrimp has no biological basis. The idea that our production of shrimp has declined is an absolutely sound one resulting, it is the belief of the Chief Biologist, from two factors: first, the fact that shrimp boats have increased so enormously in number, power and efficiency and, therefore, the available supply of shrimp is divided up among so many fishing units; and, secondly, that so many shrimp are destroyed or are illegally taken at an inadequate age and size when if permitted to attain adult development they would triple or quadruple the harvested volume.

The accompanying chart will permit the reader to convert numbers of shrimp per pound into average lengths of shrimp (measured from tip of head spine to tip of tail spine) and will



RELATION OF SHRIMP LENGTH TO NUMBER PER POUND.

Length in Inches—Based on Measurements of 6120 Shrimp. Males and Females Combined.

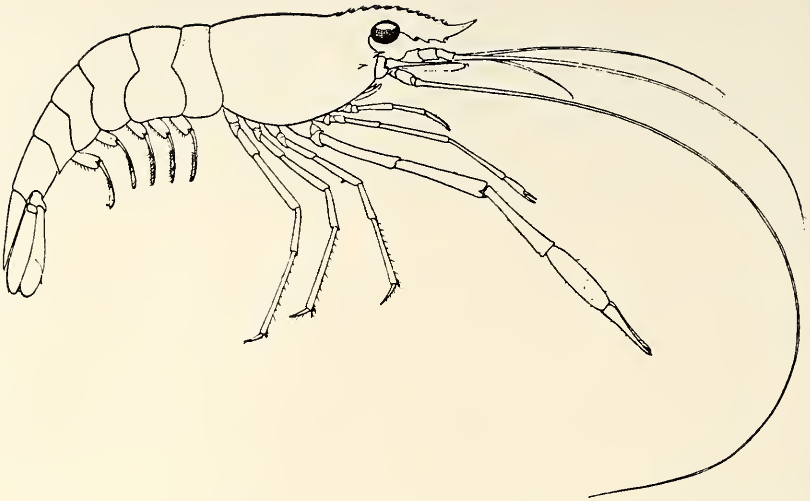
further show the tremendous increase in volume that shrimp gain with length. Thus, whereas 150 shrimp two and three-fourths inches long are required to make up one pound, only ten shrimp seven and a half inches long weigh one pound. The chart may be used by dropping a vertical line from any point of the curve and reading number of shrimp per pound in the vertical scale and length in inches per shrimp in the horizontal scale.

This chart was prepared by the cooperative shrimp investigations on the measurements of 6,120 individual shrimp and, as will be seen, the values are unexpectedly uniform.

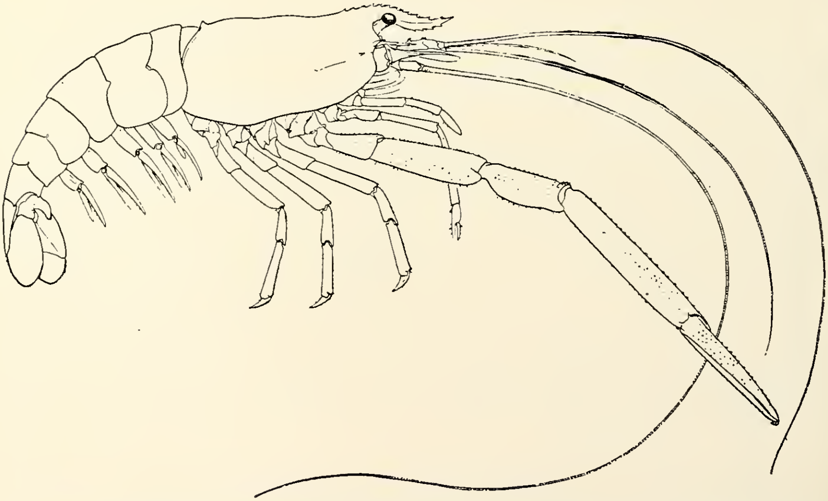
The Red Grooved Shrimp has met with certain market resistance in the North because of the fact that although their natural color is reddish, giving them the name of "Brownie," this normal condition is mistaken by many buyers in the northern market for the reason that they mistake the reddish color as a sign of staleness. The Common Sea Shrimp (Lake Shrimp), which is white when fresh, does acquire a reddish color when the shipments are held too long.

A program that may have importance and valuable results for the shrimp fishery in Louisiana and described hereinunder is the long range survey and exploration of the fishery resources of the Gulf of Mexico. This involves two possibilities, later discussed more fully. These are the possible discovery of new commercially valuable concentrations of the Common Sea Shrimp in the Gulf of Mexico, and the possible discovery of commercially valuable concentrations of the Red Grooved Shrimp, whose market acceptability is steadily improving due to the realization upon the part of the northern market that the "Brownies" are fresh in spite of their color, are available in the same desirable size ranges as are the Common Sea Shrimp and are equivalent in flavor and quality.

The writer conducted observations concerning the possible effects on shrimp population of the intense September 17, 1947 hurricane which devasted the coasts of Louisiana and Mississippi. This hurricane, which destroyed in excess of fifty million dollars worth of property and caused tides from the ocean inundating some areas of land as deeply as fourteen feet, naturally effected the transport of massive quantities of sea water and their contained marine life often far inland.



THE RIVER SHRIMP. The River Shrimp, much smaller and less widely known than any other marine shrimp, is in New Orleans a favorite delicacy. Its technical name is **Machrobrachium ohionis.**



THIS CENTRAL AMERICAN FRESH WATER SHRIMP CAN INDIVIDUALLY WEIGHT THREE AND ONE-HAIF POUNDS. This is the southern "first cousin" of our River Shrimp that reaches the northern limit of its range at about the latitude of Louisiana. The writer has received specimens from Bayou Terrebonne that were captured in a sunken boat. Proposals to introduce this species into Louisiana would probably meet with no success although the fact is that a single spcimen of this "River Shrimp" may readily reach a weight of three and a half pounds. One specimen brought the writer measured from tip of claw to tip of central tail spine 17½ inches.

Investigations showed that shrimp as a result appeared in areas where they had never been taken for many years, together with the also exceptional presence of such marine fish as flounders.

Observations extended into the subsequent year, which comes within the domain of this report, failed to reveal, however, that this violent hurricane affected in any way the subsequent shrimp crop, a result which shows clearly how well buffered, because of its physical characteristics, the Louisiana coast is against critical damage since, unlike the seafood areas of Maryland and Virginia, our five hundred miles of coast line, although hit by a one hundred mile an hour hurricane in local areas, has sufficient reservoir capacities to restore the stock of an organism such as the shrimp. It must be remembered that the shrimp is a one year animal, extremely prolific and that its eggs, young and adults are capable of being distributed long distances by coastwise currents.

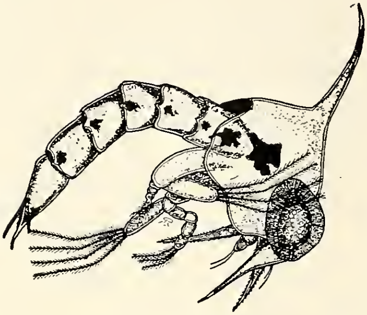
Louisiana Crab Fishery

The crab fishery represents an extremely valuable "cash crop" for Louisiana fishermen and Louisiana possesses what is probably the best area for crab meat production in the United States.

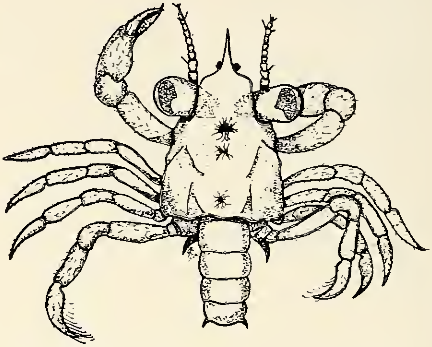
It is the purpose of this discussion to accomplish four things: first, to convey to the reader some idea of the crab and its life history; second, to indicate the production of crabs in Louisiana waters; third, to describe methods that elsewhere in the United States have improved crab catch tremendously; and, fourth, to make certain recommendations concerning crab conservation.

The Blue Crab, the technical name of which is *Callinectes sapidus,* is one of several closely related crab species similar in appearance that occur in the Gulf area. It alone is the crab of commercial importance in Louisiana. Crab life history should be here set down since perhaps only one person in one hundred thousand who eats a crab cocktail knows anything in the world about how the crab produced the material to make that cocktail. Two outstandingly important centers for the production of the Blue Crab exist in all of North America. These are Louisiana and Chesapeake Bay.

The Blue Crab depends for its productivity upon the outflow of fresh water from the continent into marine areas. Louisiana has the tremendous advantage of the Mississippi River (which results in Louisiana's production of 70 per cent of the total crop of shrimp for the United States plus Alaska, and 50 per cent of the total production of muskrats in the United States) but the difference is that the outflow of water in Louisiana covers five hundred miles of Louisiana coast line (the influence of the Mississippi River can be scientifically established as far east as Mobile Bay), whereas in the case of Chesapeake Bay, the crabs in the normal course of their life history come under the jurisdiction of two states—Maryland, where they breed, and Virginia, where they produce their young.



ZOEA STAGE OF BLUE CRAB. This is what the crab that you eat looks like when three days old. This illustration shows the appearance of the crab before it assumes the appearance of its parents. **(After Newcombe.)**



MEGALOPS STAGE OF BLUE CRAB—The megalops stage of the minute Blue Crab constitutes the last larval transformation before it again undergoes a complete change of form and becomes a minature of its parents. **(After Newcombe.)**

A female crab mates only once, but from this single mating, she is capable, it has been recently learned, of producing two "egg sponges", each of which may contain as many as four million eggs, every egg capable of producing, under appropriate circumstances, an adult and desirable soft shell crab.

Crabs, like shrimp, undergo strange transformations in the course of their development. Thirteen days after hatching, they become grotesque, spiny forms, known technically as *Zoea*, here illustrated. The immediately preceding stage, called the *Prozoea* by scientists, is only three one hundred and twenty-fifths an inch long. This, after eight successive stages of transformation, becomes the Megalops, here illustrated. Preyed upon by innumerable enemies during early growth, crab productivity is so great that they nevertheless populate all the available areas in which crabs can grow up.

Blue Crabs have a tremendous range and a tremendous tolerance. They occur all the way from Nova Scotia, Canada to Uruguay, South America, and during their migrations have been known to travel from the Louisiana coast up the Atchafalaya River one hundred and sixty miles inland to Simmsport, Louisiana. During their breeding, they produce so many larval young (minute forms capable of study only by means of a microscope) that the writer has been able off the coast of Louisiana to collect two and one-half solid quarts of them by towing a special "plankton" net for only twenty minutes.

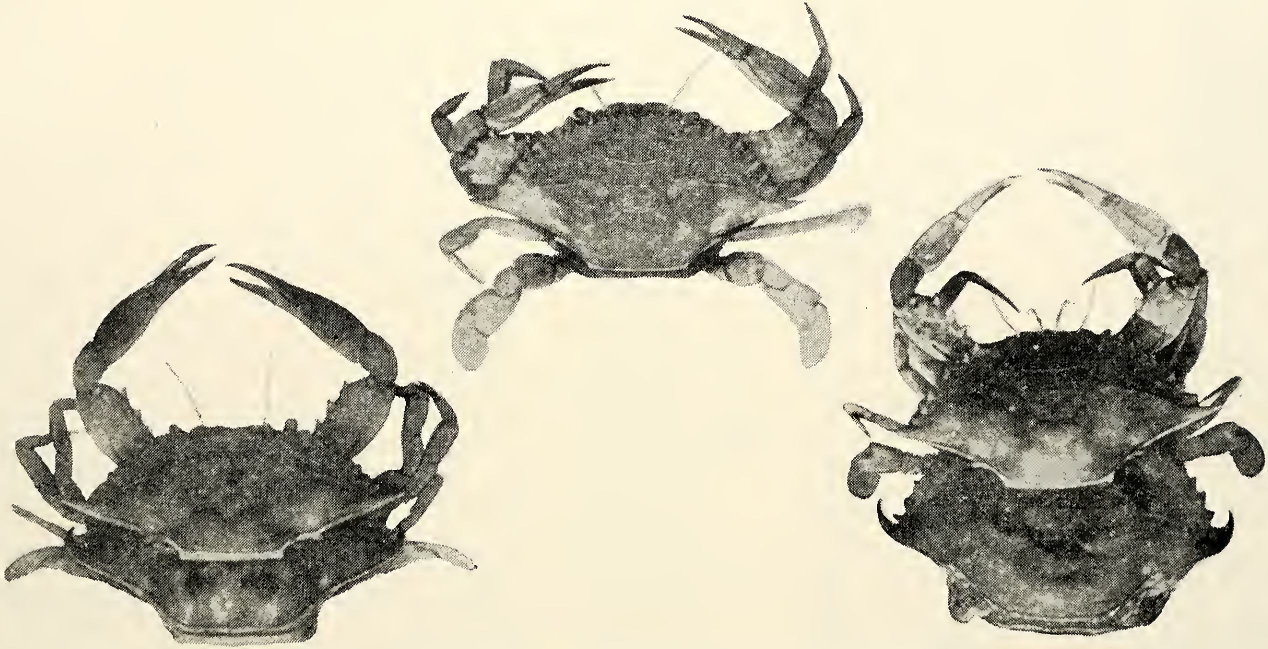
Molts Shell

In the beginning, this first crab-stage molts its shell every few days. In later larvae molts become as much as twenty-five days apart. The rate of growth is probably greatest in the warmer waters and more favorable seasonal conditions of Louisiana.

The male crab, readily recognized by the absence of the broad apron typical of the female, probably becomes sexually mature when measuring three and one-half inches from the tip of one "side spine" to the tip of the other. Crabs are certainly sexually mature when they are a year old and, as far as is known, have a life span of about two or three years. The only way such information can be accurately secured is by "tagging," which has not yet been done in Louisiana waters. Careful tagging studies elsewhere in progress provide much useful data.

As has been mentioned, crabs usually move into saltier waters for mating and "sponge" formation. When preparing to molt, the "peelers" move into shallower water where vegetation gives them sanctuary and a "rubbing" place.

This molting is the only means whereby the crab can grow, since otherwise it is confined within its own inelastic outside skeleton. The molting itself is both extraordinarily interesting



BLUE CRAB SHEDS. FIRST STAGES. Process whereby a hardshell crab becomes a softshell crab is rather a mysterious matter to most people. In upper center crab is beginning to break out of its shell which is its skeleton. Unlike ourselves, crabs bear their skeletons on the outside. No means has yet been learned whereby we can compel a hardshell crab to become a softshell crab by chemical or mechanical treatment unless it is all ready to shed. In upper center, one sees beginning of break of crab's skeleton where the back shell (carapace) separates from the crab's body. Lower left and lower right clearly show how a crab emerges.

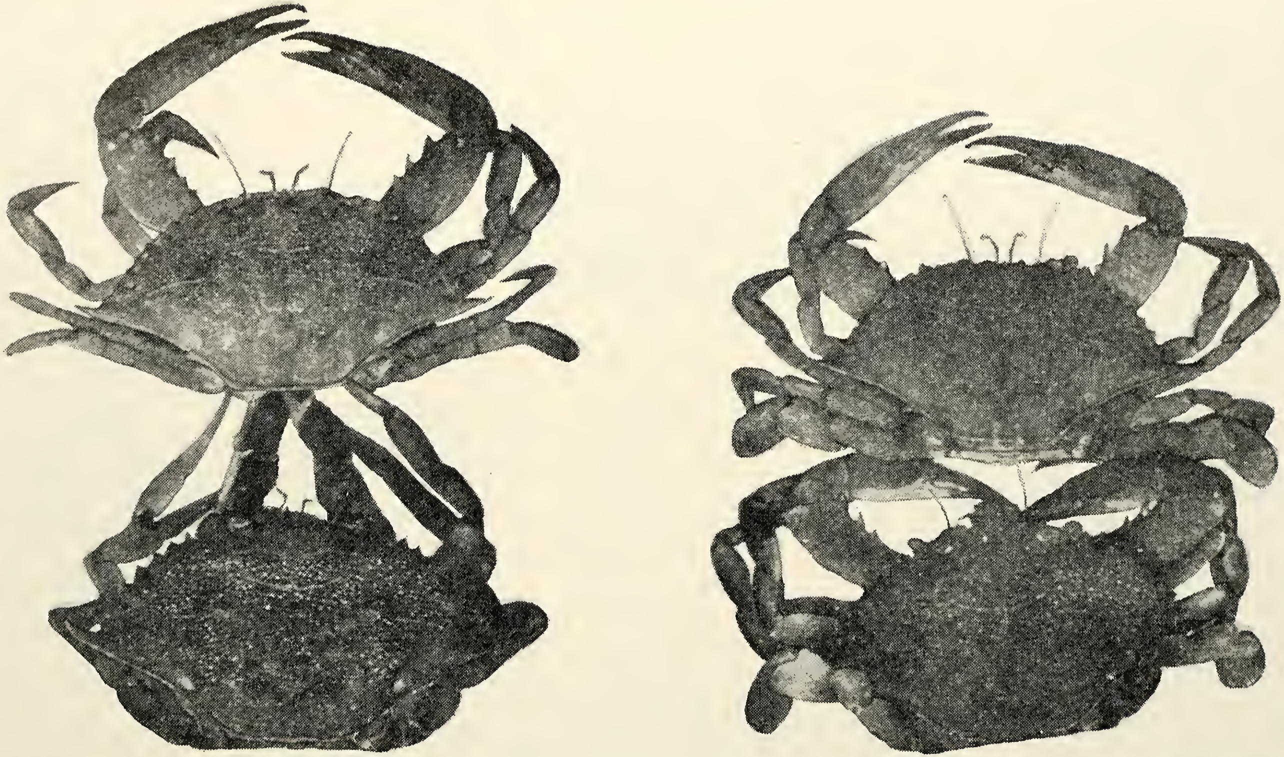
and extraordinarily complicated. Illustrations here provided show these dramatic transformations.

Crabs molt when changes in their tissues have become such, chemically, that they must grow by imbibing water, and this process sets into action a remarkable chain of events. The onset of the molting can readily be detected by the experienced crabber through the appearance of a slender but easily observable pink line on one of the swimming appendages. Various names are given to the different stages. "Green" peelers are crabs not shedding for several days; more advanced peelers and "rank" peelers are crabs actually shedding and "busters" are crabs in which the back shell is actually cracked free from the apron. Usually, where soft shell crabs are produced in floating coops, termed "floats," they are all separated into these various classes.

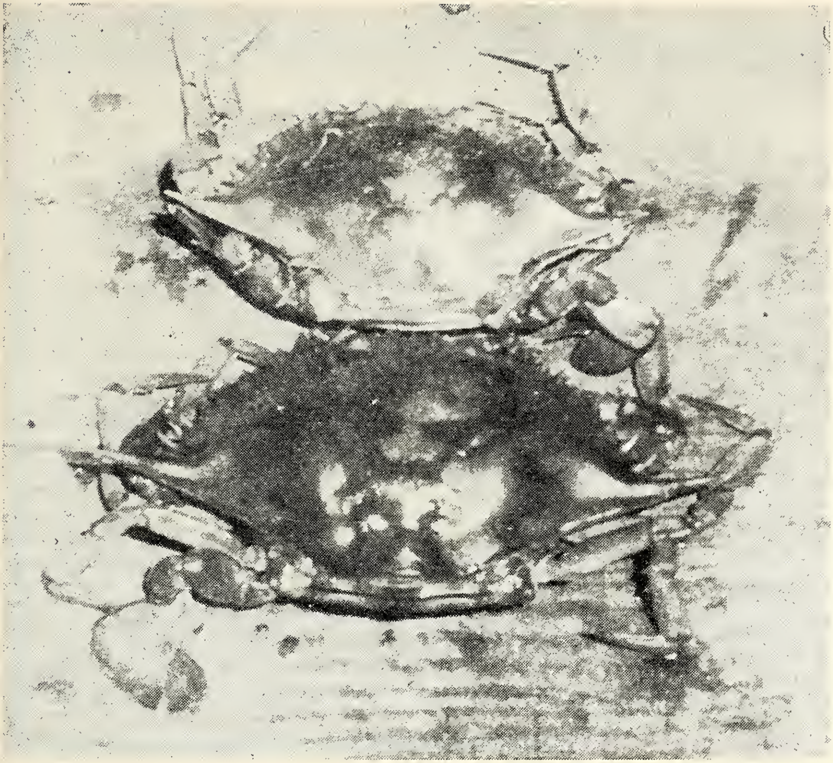
Soft shells are left in the water for a few hours before being removed. This permits them to grow by imbibing water. As a matter of fact, within a matter of minutes crabs can grow 20% of their former size. Also, they are extremely physically delicate immediately after molting, and if removed then will in all probability die. They must, however, be removed within a variable length of time, depending upon the temperature and other conditions of the water.

The actual process of molting is unforgettable. The details are too involved to be presented in this brief space, but they include, as first indication, a narrow white line, barely visible, which appears just within the thin margin of the last two joints of the last pair of legs. This white line, three or four days later, is replaced by an equally narrow and almost obscure pink line, together with other minute indications. Further changes rapidly occur and the crab is now a peeler.

The under surface of the crab's shell now shows a narrow break so that the back (or carapace) can be easily lifted like a lid, exposing the soft body underneath. This is a buster or shedder. The crab now remains very quiet. It can still swim or walk, but with difficulty. The complete emergence of the crab from its shell now takes only a few minutes, usually not more than a quarter of an hour. The hind legs are pulled out of their shell, and as the other legs are removed, the body emerges more and more posteriorly until the entire, now helpless, crab appears. Most



BLUE CRAB COMPLETES SHEDDING OPERATION. Herewith are shown the stages succeeding those already indicated. The crab, now emerged from its shell, can, by imbibing water, within a matter of minutes grow at least one-fifth of former width. See later photograph by Roger White.



BLUE CRAB. SHED SHELL ABOVE. EMERGED SOFTSHELL CRAB BELOW. This photograph shows the discarded shed shall of the crab (above) and the suddenly grown softshell crab (below). This remarkable increase in size is due to the fact that the tissues of the crab immediately imbibe water. Crabs may thus grow as much as twenty per cent in width within a matter of minutes. Since the crab skeleton is not internal, like our skeleton, but is a constrictive external structure, the crab is incapable of growing without passing through the elaborate process of shedding. **(Photograph by Roger White.)**

remarkable is the fact that the flesh of the thick claws can be withdrawn without breakage through the narrow joints, an operation made possible by the softening of certain shell parts.

Minutes later, the crab fills out and is then known as a soft shell, brilliant in color because its pigments are not concealed by the hard outer skeleton. The new shell is secreted in the form of a liquid over all of the crab's surface, which very rapidly hardens on exposure. Within as little as twelve hours, such a crab hardens enough to become a "buckram" crab, which is too tough for marketing as a soft shell. Within two or three days, the crab has sufficiently recovered its shell to go again in search of food. The Blue Crab in the soft shell condition is one of our finest marine delicacies.

Many Questions Asked

Many questions are asked concerning this interesting as well as luscious seafood. One of the most frequently received is the request for an adequate and easy method of compelling a Blue Crab to shed and thus promptly and pleasantly become a much more desirable and more valuable soft shell crab. The answer to this is that when a crab sheds, it does so because it must, and there is no physical or chemical way of hastening or retarding this molting. The crab hasn't a thing in the world to do with it, nor can anyone order it to do so. Growth in crustacea involves a whole chain of physiological events. The end result is that the crab must grow and the only way it can grow is to shed its external skeleton. These events are preceded by very clear and significant indications. As has been mentioned, a fine white line followed by a thin carmine one appears on the swimming appendages of the crab, and this sign, expertly detected by people concerned with producing soft shell crabs, tells them that the crabs under observation will, within a matter of hours, break out of their shells and become soft shell crabs.

The Blue Crab lives in salt water and in brackish water and although in the north it is seldom found far at sea, in the Gulf of Mexico it has been observed far offshore.

Recently it has been established that the Blue Crab is capable of destroying oysters and for this reason, oyster men have come to feel that the Blue Crab, the means of livelihood of very many people, is one of their enemies. It is the opinion of the writer that although these observations do establish the fact of some destruction of oysters are true, restrictive measures are most certainly not necessary against *Callinectes sapidus*.

Also, on the other hand, there have been many allegations that today's sea trawling for shrimp has had a damaging effect on the supply of Blue Crabs. No available evidence supports this belief. It is perfectly true that in normal shrimp trawling procedures, crabs are caught, but their number is so small in comparison with the normal catch that any such effect is negligible.

Particularly, it is necessary to discuss the sincere, but quite erroneous ideas that seismographic operations cause great mortality of Blue Crabs on the Gulf Coast.

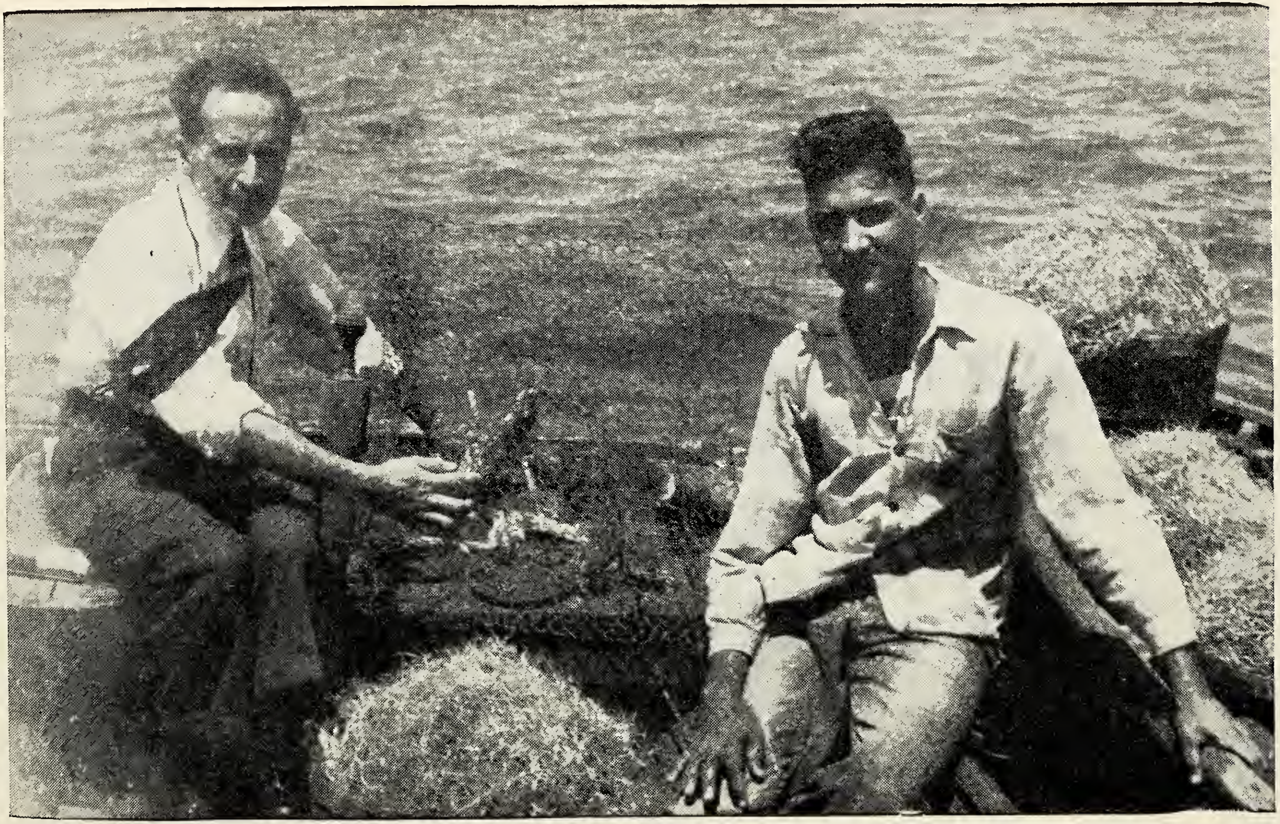
In one instance, it was alleged that windrows of crabs existed over at least one hundred miles of seaward beaches of Louisiana due to the effects of the discharge of dynamite in the search for oil. The writer personnaly investigated and ascertained that at that time ten explosions of ten-pound charges had occurred in an area of thirty-six square miles where search for the allegedly killed crabs was carried out.

Subsequently, at very considerable expense, a carefully devised series of experiments was conducted by the writer and associates involving the use of excessively high charges of dynamite—up to 800 pounds in a single shot—and it was found that these extremely heavy explosions did not harm crabs unless, because they had bred, those crabs would, in the natural course of their lives, have died within a few days anyway.

The appearance of great numbers of crabs along the seaward beaches must be expected every year because having ended their life cycle, they die, and their bodies are cast, sometimes in spectacular fashion, on the sands in windrows at the crest where the waves reach the shore.

An immense amount of research has been conducted with great practical usefulness concerning procedures in the handling of iced, quick-frozen and canned crab meat. At first technical difficulties arose in the canning of crabs because of the darkening of the crab meat but these have been resolved by the employment of lining papers impregnated with chemicals that absorb the hydrogen sulphide which is the cause of this "blackening".

Particularly significant are the handling procedures whereby fresh-picked crab meat is pasteurized. Just as in the application of this process for the proper handling of milk, so also is this application of controlled heating valuable for crab meat. All the technical details of this operation will be gladly furnished by the writer if requested. Briefly, such handling of crab meat does not impair the color, the aroma or the taste, and does not



EFFICIENT CRAB TRAP. The writer brings to attention of typical, competent Louisiana crab fisherman the crab trap that is an efficient method of capturing crabs in large quantities and permits release, undamaged, of undersized crabs. (Photograph by [illegible] Picture Service.)

involve any changes in plant equipment. Crab meat is very perishable, and pasteurization has proven to be of invaluable help in effecting its proper handling.

The value of crab meat as food is extremely high. White crab meat is, investigations show, as rich (or richer) in calcium, magnesium, phosphorus, iron and copper than are most sea foods, is six times richer in iodine than milk and forty times richer in iodine than beef. It also contains rich sources of vitamins, particularly A, B^1 and C.

Three Methods

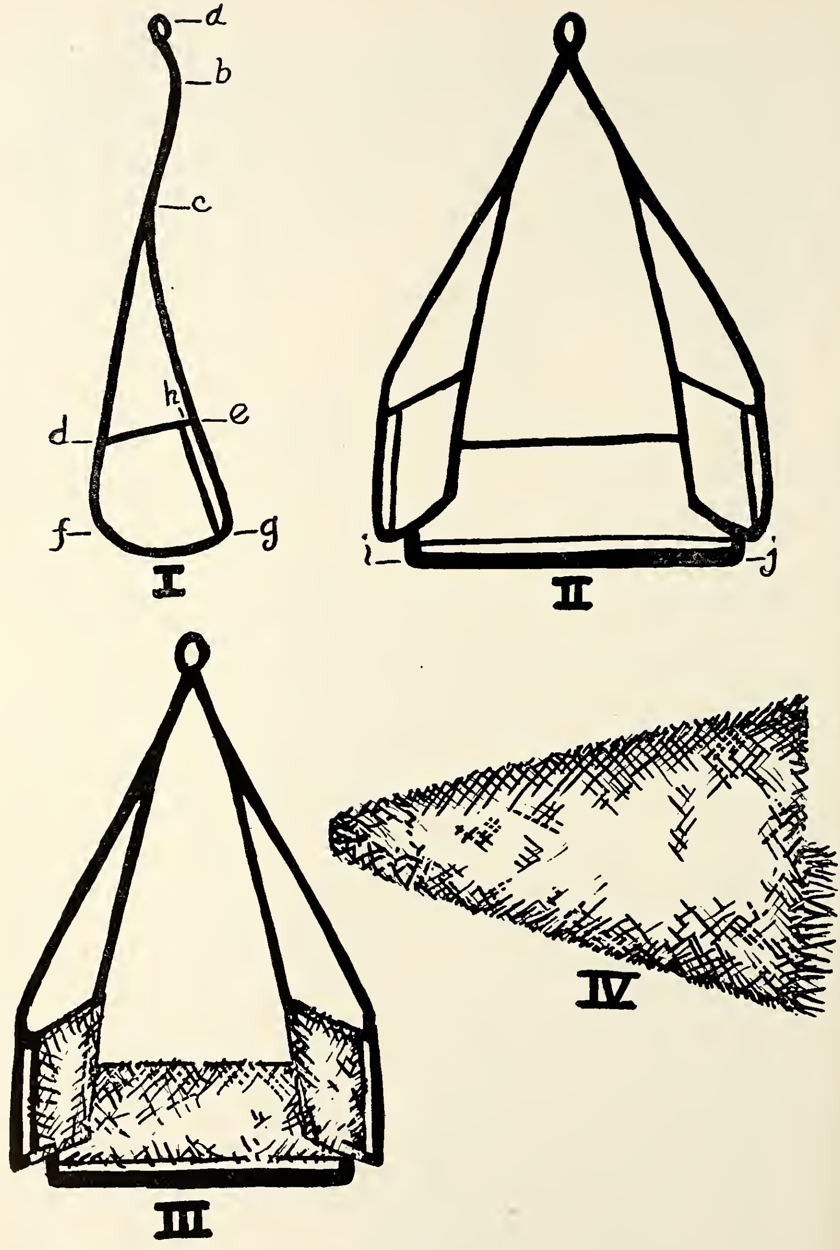
Three crab fishing methods, two for the taking of hardshell crabs, the third for the taking of softshell crabs, have been practiced with great success for over forty years in other crab producing sections of the United States.

The writer believes that the adoption of these techniques in Louisiana waters would serve two excellent purposes. First, they would increase crab production, and, second, their practice would result in better conservation of the crab supply.

The first method is a modification of the Louisiana technique for running a crab trot line. This is illustrated in an accompanying photograph. This method, adaptable to many Louisiana waters, simply makes considerably easier the handling of the trot line. Details will be provided on request.

The second method is the use of a modified type of crab trap which is herewith illustrated. The measurements of the various parts are provided under the photograph of the trap. This trap has the following excellent characteristics. It is inexpensive and can also be constructed relatively readily even by the fisherman himself. It has good, lasting qualities, it is highly productive. Most important of all from the conservation point of view, it definitely eliminates the destruction of under-sized crabs. Crabs below legal size can readily be returned unharmed to the water.

The third technique is devised for the capture of softshell crabs and, as far as the writer has been able to observe, is both the most effective method of taking softshell crabs without damaging them and is, also, from the point of view of conservation, the best instrument for that purpose.



SCRAPE FOR TAKING SOFTSHELL CRABS. This highly efficient equipment is used for securing softshell crabs by dragging it over a "grassy" area. Crabs, when shedding, seek the shelter of such grass and congregate there, often, in large numbers. The equipment serves two excellent purposes; first, it rolls the softshell crabs in the detached grass without damaging them; second, scrape "cultivates" the vegetation by tearing out dead or dying plants.

Details of construction are shown in the accompanying illustrations. This type of crab scrape consists essentially of a welded iron frame. The thickness of the components of the iron used is indicated in the underline to the illustration. The construction is illustrated as viewed from the side in Figure 1, from the front in Figure 2, from the front again but with the net attachment indicated in Figure 3, and the general shape of the net as viewed simply as a flat object in Figure 4. The actual measurements are here given for clearness as indicated from the lettering shown in Figures 1 and 2, and are as follows: internal diameter of ring at *a* — 1″; length *a* to *b* — 3¾″ *b* to *c* — 20½″; *c* to *d* — 33½″; *c* to *e* — 22½″; separation between *e* and *h* — 1½″; *d* to *f* — 13½″; *e* to *g* — 17″; *f* to *g* — 12″; *i* to *j* — 40″. The net laid out as placed in Figure 4 measures 40″ at the front edge, 62″ in depth and 15″ across at the base.

Details concerning the construction and operation of these three types of crab gear will be gladly furnished to anyone who desires them.

The basic needs for the preservation and expansion of the Blue Crab industry in Louisiana include the following recommendations, some of which are already being carried out in other states,

First, the gathering of reliable production figures. If it is possible, such figures should include information not alone of the total production and kinds of production (hard shell crabs, soft shell crabs, fresh crab meat and canned crabs) but also figures showing the "fishing effort"—that is, the number of men, the types of gear, and wherever possible, the time required for a unit production. This is obviously a program presently impossible of attainment in Louisiana. But any approach toward securing such figures would be of great benefit.

Second, the substitution of crab trap capture of hard shell crabs for the present methods of commercial harvesting by crab nets or trot lines, and the use of crab ground harvesters for the capture of soft shell crabs wherever possible. The writer will be most willing to furnish without charge, the details of the construction, cost and practical value of this soft shell crab harvester, which has three great virtues: First, it is most efficient; second, it is in terms of conservation, excellent, since it does not destroy undersized crabs; third, it definitely improves the condition of the soft shell crab areas. This useful soft shell crab harvester is not known in Louisiana, and yet it has been in use for the last two or three decades by other crab producing states.

Third, a definite program of education to provide more facts in an understandable way to all concerned with the crab industry. It is clear that the success of the earlier two categories of recommendations will depend upon the success of such a program.

Fourth, the enforcement in every practical way of the regulations against these three things:

a. The capture of sponge-bearing females. This is especially important since, with the death of such an individual will perish also from one to several million potential crabs. It is sad to report that camps have often been visited where several baskets of such sponge-bearing females, whose eggs were in various stages of development up to that of hatching, have lain dying in the sun.

b. Enforcement of the regulations prohibiting the taking of undersized crabs. Crabs grow rapidly in Louisiana and useless, unmarketable small individuals, if returned unharmed to the water, could quickly become of commercial value. The use of crab trap will make such an operation particularly easy.

c. Adequate patrol or other effective control to eliminate the use of forbidden gear such as the destructive crab trawling, the operation of which takes crabs irrespective of size and so jams them together that great numbers die. Barrels of crabs have been observed dumped from such gear, the greater proportion of which, including a devastatingly large number of young, undersized crabs, had already died and were therefore of no value to anyone.

Should these recommendations be carried out, there is no doubt that the vastly profitable crab harvest would increase immeasurably. In fact, despite the faults current in the system, the statistics for Louisiana are remarkable. According to these figures, very carefully compiled by Mr. William Werlla of the Louisiana Department of Wild Life and Fisheries, during the last twelve years the State of Louisiana has produced 17,192,595 *dozen* hard shell crabs, 2,982,139 *dozen* soft shell crabs, and, what is much more important, a total 32,208,329 lbs. of crab meat, which is one of the luxury products of the United States. The average follow: 1,432,716 dozen hard shall crabs, 248,511 dozen soft shell crabs and 2,684,027 lbs. of crab meat.

More refined processing methods, more efficient fishing techniques, together with enforcement of adequate conservation measures, should ensure the continued and expanded success of Louisiana's crab fishing industry.

Menhaden

Menhaden occupy a unique role in the economy of the ocean and in the economy of man, in whom these fish have certainly had no personal interest. As Fairfield Osborn and William Vogt have so well expressed the idea of a "Plundered Planet" and in the "Road to Survival," must inevitably lead man to contemplate his use of the vast and strange fields of the vast and strange oceans of the planet upon which we dwell.

MENHADEN. **Brevoortia tyrannus** (Latrobe). The Menhaden is the most important in point of volume of all the fishes of the western hemisphere. The illustration is of an Atlantic Coast species so closely similar in appearance to the Gulf of Mexico Menhaden that the two kinds of fish can only be differentiated by careful study. **(After Fowler.)**

Menhaden in those oceans perform a peculiar although not a unique part. They harvest the "grass of the sea", the diatoms, desmids and dinoflagellates, copepods and other teeming microscopic plant and animal organisms of the seven seas. Their ichthyological alchemy transforms them into lipstick, house paint, chicken food and even invaluable drugs for human use.

The Menhaden fishery has risen spectacularly to excel by its over than one billion pounds annual production all other single fisheries in the western hemisphere. These figures have been very kindly provided to the speaker by Dr. Lionel Walford of the Fish and Wildlife Service, U. S. Department of the Interior of the United States. What makes the impact of this fact more severe is that at no time in our recorded history have the materials derived from the Menhaden fishery been more critically needed.

The writer had the great privilege of participating in the recent United Nations Conference at Lake Success, New York, the first ever held designed to contemplate in a global pattern the utilization and conservation of this planet's natural resources in terms of world nations and world populations.

It is necessary in the evaluation of any fishery or other resource to orient oneself and see wherein in the pattern of human economy that fishery fits.

Two species of Menhaden exist on the Atlantic Coast. Two species exist on the coasts of the Gulf of Mexico. Their pursuit and capture is accomplished by a highly specialized fishery method, i. e., the use of peculiar gear called the purse seine.

It should be pointed out that the United States in 1948 produced 56,200 tons of fish oil, our republic being the largest producer of fish oil in the world. It should be further pointed out that in that year, 1948, Menhaden provided 49% of our total fish oils.

A vast amount of careful scientific research has established the importance of the amino acids derived from Menhaden protein products, known as fish water or "fishstick" and no longer dessicated to the stage of fish meal. Within the past few months there has appeared a flood of papers indicating that these amino acids (which are the building stones of proteins that make up the structure of all animals, including man, and of all plants) are not adequate when they are derived from plants, but when they are supplemented by the addition of only five per cent of fish amino acids (in these experiments specifically fish amino acids derived from Menhaden), the deficiencies are remedied and an astonishing impetus is given both to growth and, in the instance of poultry, to egg production.

One factor must be here emphasized. The essential conduct and the desirable expansion of the Menhaden industry comes into violent and head-on collision with one fact or popular misunderstanding of three things: first, the fact that the proper use of the Menhaden fishing gear, the purse seine, does not involve the capture of game fish or other commercial fish; second, the fact that, as established particularly by the excellent pioneer and convincing studies, augmented by still unpublished and scientific surveys supervised by Jack Baughman, Menhaden do not constitute an element of any importance whatever in the food chain of game fish or of other commercial fish; and, third, that the proper use of the purse seine (which is the only practical use of this gear) does not in any way damage the nursery grounds of shrimp, of game fish or other commercial fish or of oyster grounds.

Not a Food

Menhaden are not used directly as human food, although during the war an attempt at canning these species for human use was made.

Utilization of Menhaden exceeds in length of time any other application of fisheries' products in continental America since the Indians did instruct the Pilgrims to plant Menhaden and corn together and grow better corn.

The intervening years have held the record of changing and technologically more and more refined processing.

Menhaden oil, the first product, was simply secured by permitting the fish to rot in barrels. Later, omitting the long intervening history, it may merely be pointed out that the fish scrap became fish meal, used to fortify stock foods.

The writer served as a member of a wartime committee of the National Research Council, upon whose recommendation the President of the United States, issued an order forbidding the use of any fish meals as fertilizer since its value elsewhere was so great.

The present situation is this. At no time in this history of the world has there been greater need of the proximate and ultimate products of the Menhaden industry than there does now exist.

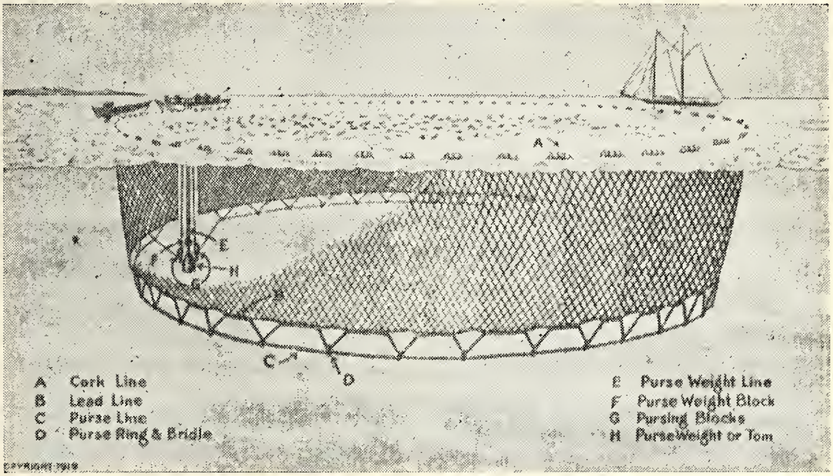
HEAD OF MENHADEN. A member of the herring-like fishes, the Menhaden represents one of the most useful marine fisheries resources in the entire western hemisphere. Production of Menhaden has for the first time exceeded the production of all other fish species in North, Central and South America.

The Gulf of Mexico, with 750,000 square miles, one of the great inland seas of the world, remains virtually unexplored. Its potential productivity may well be not alone of national but of global importance. The investigation of the Gulf of Mexico should be given high priority in any national hydrographic and marine biological program and the search for knowledge of Menhaden resources should have in that high priority a high position on the scientific agenda.

The following amplified discussion is regarded as desirable because of the growing importance of the Menhaden fishery not only in the Gulf of Mexico and in the United States but in its value to contributing to animo acids and vitamins that the world now greatly needs. This account will, therefore, set down in a brief manner the known facts concerning the relationship of the operation of Menhaden gear to other fishes in the Gulf of Mexico, and the part that Menhaden play in the pattern of the Gulf of Mexico sea life.

The great value of Menhaden meal as a source for fertilizer and later as a supplement for stock foods was but the beginning of further discoveries concerning its essential value.

Herewith also will be given a brief description of the methods whereby Menhaden are caught and illustrations of the use of the purse seine and the operation of the boats in actual capture of Menhaden.



PURSE SEINE. The purse seine is an extremely peculiar fishing gear incapable of being efficiently operated unless it is off the ground. This illustration shows the purse seine before the "tom weight" has been dropped and the purse seigne goes into operation. **(After Tressler.)**

The methods of capturing Menhaden progressively changed until the use of the gear known as the purse seine became the standard procedure. Delayed, but greatly more rapid in its success, was the refinement of the end products, viz., the fish meal and the fish oil. Treatment of Menhaden oil first permitted its use as a rapidly drying paint vehicle. Subsequently, researches initiated and conducted by the Fish and Wildlife Service of the United States Department of the Interior so refined Menhaden oil that it became a highly valuable product used in the manufacture of high quality soaps and cosmetics, thus expanding its former general market in the manufacture of linoleum, paint and the tanning of leather. One hundred and sixty-five different uses of Menhaden oil and Menhaden oil by-products are at present operating.

It was subsequently realized that the substances contained in Menhaden fish meal were of highest importance. It is necessary, if this be understood, to refer a moment to certain scientific aspects of nutrition. Although at first glance it may appear that this has nothing to do with the problem immediately at hand, it most certainly does.

Broadly considered, foods fall into three classes, carbohydrates (such as starches and sugars), fats (such as butter and olive oil), proteins (such as beef and fish). Carbohydrates and fats may be stated, with general accuracy, as providing the fuel for the machine, while proteins form the actual structure of the machine, whether it be a fish, a bird or a man. Proteins in turn are highly complicated substances constructed of building stones known as amino-acids. Recent and completely confirmed research show that the amino-acids that make up the construction of our human bodies are more available from fish than they are from meats, which is rather an unexpected discovery.

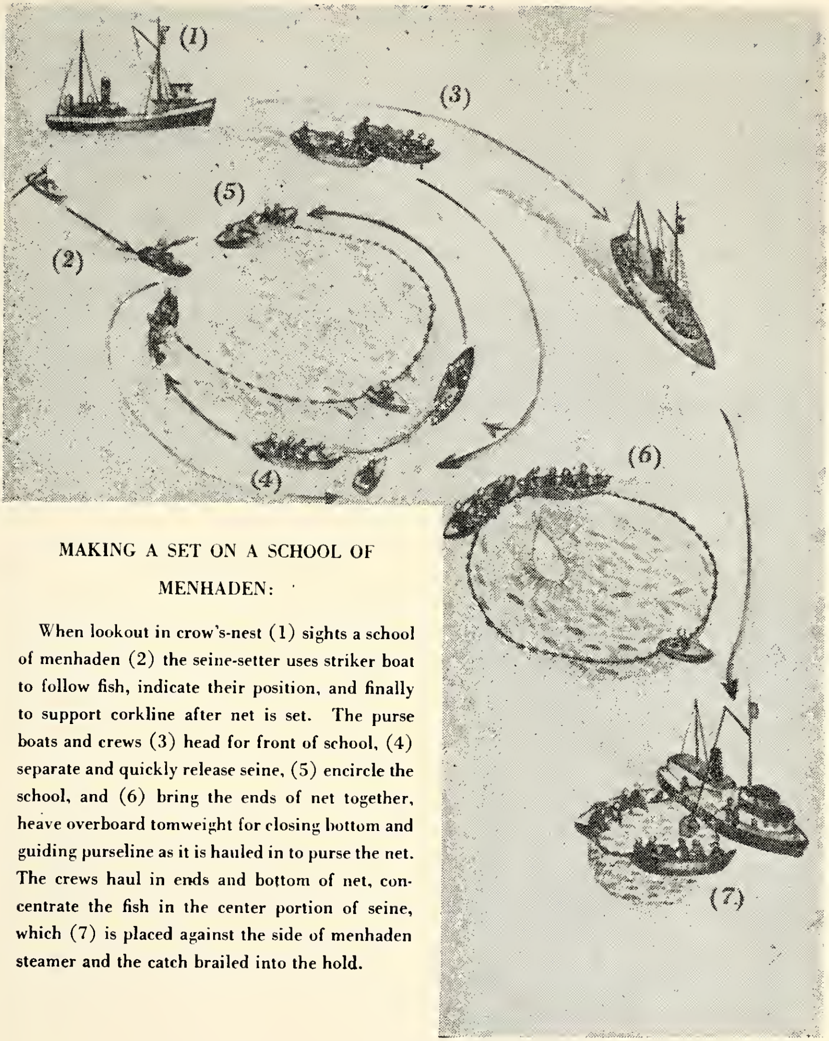
Tens of thousands of lives of American and other allied prisoners of war who had been starved in Nazi and Japanese prison camps were saved by the administration to them upon their liberation of these purified amino-acids.

So well is this now understood that no longer do the Menhaden reduction plants continue the processing of Menhaden to the stage where the pressed scrap becomes fish meal, but they sell the product in the form of a liquid, and, furthermore, many plants recover the soluble amino-acids by an additional recovery treatment of the water used in the initial extraction of the proteins.

The fish oil is usually extracted by a twenty-two minute opreation at 350°F.

The protein of the fish scrap runs from 60% to 65%. Some plants specialize in their procedures, coordinating the processing so that one plant crushes the oil and produces the fluid protein product while another plant treats the runoff water and saves the water soluble amino-acids.

The purse seine is essentially a net held up by floats and held down by leads forming a vertical wall which when the Menhaden school is sighted is set so that it forms the circumference of a circle in which is enclosed the school of Menhaden. When the school is enclosed, a special weight is tripped, as the result of which the whole purse seine closes in at the bottom forming a "bunt" in which the Menhaden are captured.



MAKING A SET ON A SCHOOL OF MENHADEN:

When lookout in crow's-nest (1) sights a school of menhaden (2) the seine-setter uses striker boat to follow fish, indicate their position, and finally to support corkline after net is set. The purse boats and crews (3) head for front of school, (4) separate and quickly release seine, (5) encircle the school, and (6) bring the ends of net together, heave overboard tomweight for closing bottom and guiding purseline as it is hauled in to purse the net. The crews haul in ends and bottom of net, concentrate the fish in the center portion of seine, which (7) is placed against the side of menhaden steamer and the catch brailed into the hold.

The only way that a purse seine can be operated effectively is that two conditions be met.

First, the lower border of the purse seine must clear the ground and at no time come in contact with either the actual water bottom or any growth of bottom plants. After such a contact is made, the operation of the purse seine becomes completely interfered with and, in any case, where the seine would be dragged over the bottom, the seine would be so badly damaged that the operator would lose money even if his Menhaden catches were abundant. It may be useful to re-describe the whole mechanism whereby the purse seine operates. Essentially, the purse seine is a bag net. It does not start in the form of a bag, but starts in the form of a vertical ring-like wall, the bottom edge of which must not touch either the ground or any other obstructing object.

As has already been stated, Menhaden have the peculiar characteristic of schooling only with Menhaden. They do not travel in mixed groups of game fish and other commercial fish. Also, as has been indicated, they do not provide in any except a completely negligible degree food for either game fish or commercial fish.

Furthermore, any game fish that happen to be in the vicinity of a school of Menhaden have, as repeated observations have proven, the instant reaction of "sounding."

When the surfacing school of Menhaden is sighted, the vertical ring of the purse seine is set and as soon as this ring has been closed by the seine boats, the tomweight is dropped whereby instantly the lower wall edge of this ring-like wall is drawn together so that all of the fish above the lower wall are trapped. If at any time the movement of this lower edge is interfered with, the effective operation of the purse seine fails.

Once the "purse" is accomplished by the drawing in of the lower ("drawstring") line, it will be found that the net contains nothing but Menhaden. The rest of the fishing operation simply consists in brailing out these Menhaden by means of manually operated or power operated dip nets or their equivalent. Thereafter, the operation of completing the purse seine haul does in no way interfere with either the character of the bottom or with the game fish or other commercial fish present.

A further pertinent instance is that Mr. Clarence Frazier, operating at Grand Isle, purchased Menhaden purse seining gear for the purpose of catching Spanish Mackerel and completely failed in his enterprise. This unsuccessful attempt to catch a game fish by means of the purse seine resulted in the loss of $6,000 by Mr. Frazier when it was tried four years ago.

The writer has observed the use of the purse seine from Red Bank, New Jersey, to Cameron Parish, Louisiana, for the capture of Menhaden, and on the California Coast for the capture of the true Sardine (the Pilchard). He has observed at no time any other than an almost completely pure catch of the species of fish (Menhaden on the Gulf and East Coasts, Sardines on the West Coast) sought.

Purse seines have increased progressively in size, the former twelve thousand mesh net, one thousand feet in length, having increased, as indicated by Simmons (see citations below), to fourteen thousand meshes measuring one hundred and fifty feet in length, with the indication that the length will be increased to sixteen thousand meshes and one thousand three hundred feet.

Formerly the seine boats were propelled by oars but with the increased mechanical efficiency of the Menhaden operation, these boats were powered. The result was that the purse seine itself required to be lengthened and deepened so that the surfacing school of fish would not be alarmed by the motors and would, therefore, not sound.

This increase in depth and width of the net in no way altered the facts of the relationship between purse seining and the welfare of game fish, other commercial fish, Shrimp, Oysters and Crabs.

How They Operate

The operation of the Menhaden fishing unit is, roughly, as follows. The purse seining vessels used on the Gulf Coast range, usually, from one hundred and one to one hundred and ten feet in length and can carry about eighty tons of fish. This unit usually has as its equipment two inboard motors, thirty-three foot long winch equipped steel purse boats whose purpose is to serve in pursing up the net and a small boat known as the "striker" boat, about twelve feet long, rowed by one man, the purpose of which is to center and maintain a "fix" on the school of Menhaden.

The fish are first observed by a lookout in the "crow's-nest" of the purse seiner and the seine setter then uses a striker boat to follow the fish, to indicate continuously the position of the school and, lastly, to support the cork line so that it will not sink and permit the school to escape. The purse boats then speedily head in front of the school, separate, swing and join, releasing the seine and encircling the school until they close the vertical wall of the purse seine. When this has been accomplished, the tomweight for closing the bottom is heaved overboard and the purseline is guided by them as the net is hauled. The fish are thus concentrated in the "bunt" of the purse seine, a process termed by the Menhaden fishermen "hardening" the fish. The crews now haul in the ends and bottom of the net until they accumulate the fish in the center portion of the purse seine. The Menhaden seining vessel now moves alongside the net and the catch is transferred to the hold of the ship, usually by means of a brail. The brail is usually a net about four and one-half feet across and four feet deep with rings and a rope at the bottom much like those of the purse seine itself. It is hauled up by tackle operated by a deck motor and guided by the crew by means of a long handle. This concludes the operation of the capture of the Menhaden.

The fish are usually transferred to the Menhaden reduction plant by means of a conveyor which is an extremely efficient mechanical device whereby the equipment can be dropped directly into the hold and the fish elevated to the correct site of initial processing in the Menhaden plant.

It would seem to the writer that the operations, as far as they are of interest to the sports fishermen and other commercial fishermen, end when the Menhaden have been taken aboard the Menhaden purse seining vessel and therefore, there will be here omitted any description of the subsequent technical processing procedures which reduce the Menhaden to two highly valuable commercial products, first, Menhaden oil and, second, the liquid mixture of proteins and soluble proteins which is sold directly in this form and which is used to supplement stock foods and further to provide a source for the constantly expanding medical and nutritional application of amino-acids in stock feeding and in human medicine.

Menhaden belong to a group of fishes known as the Order Isospondyli, which includes the Menhaden, the Herrings, the Shads, the Tarpons and the Anchovies.

This group is generally described as the "herring-like" fishes. Certain species of the "herring-like" fishes have highly specialized schooling habits whereby they feed and migrate in often vast concentrations unmixed with either game fish or other commercial fish. This the writer has repeatedly seen. Huge catches of Menhaden and of Herring have come directly under his observation wherein as many as thirty tons of one of these species taken in a single set of a purse seine will include not more than twenty or thirty individuals of any other species.

Furthermore, when it does happen, as frequently, that game fish and other commercial fish may be associated with these concentrated schools, the behavior of these other fish is such that instantly these game fish and other commercial fish "sound" and cannot be captured before the tomweight closes the net. One specific instance is of immediate interest since in Mississippi waters a friend of mine spent over $7,500 trying to catch Spanish Mackerel with standard purse seine gear. This was during June and July of 1947. It was found that when these schools of Mackerel and of the False Albacore (one of the Bonitos and, actually one of the Tunas) were surrounded, these fish "sounded" and escaped, and the entire operation was a complete financial loss.

The most pertinent data is that derived from recent research. The purpose of this research was to ascertain what fish other than Menhaden were caught in the standard commercial (not experimental operation, carried out during the period of June, 1948 to August 14, 1948, by a standard purse seine, under the direction of Jack Baughman, Director of the Marine Laboratory of the Texas, Game, Fish and Oyster Commission. These investigations were carried out at the plant of the Wallace Menhaden Fishery at Cameron, La.

This boat caught more than two and a half million Menhaden during this period as against the capture of two hundred and twenty-eight game and commercial fish and sixty-two Sharks together with twenty-six Blue Crabs and thirty-four Shrimp. Two profoundly misleading sources of error exist among sports and commercial fishermen; first, the confusion by them of small silvery fishes which are actually the young of various other species of "herring-like" fishes, is not any way commercially used, particularly the Anchovies, which are not processed anywhere on the Gulf Coast; and, second, the even worse confusion by shrimp fishermen arising from the fact that when the nets are raised frequently inumerable small Shrimp are misinterpreted as being the young of our extremely valuable Lake Shrimp which forms the basis of our shrimp fishery, the greatest fishery of the entire South, pre-war sixth in volume and fifth in value of all the fisheries of the United States and Alaska). These Shrimp which so appear are not the young of larger Shrimp and have no relationship whatever to the Shrimp commercially shed. They belong to an enirtely different and, in Louisiana waters, extremely abundant species, the technical name of which is Acetes. Unlike our commercial Shrimp, they do carry their eggs and have utterly no commercial value or significance. The writer has been able to convince fishermen of this fact by bringing them into his laboratory and showing them under the microscope these tiny one-fourth inch long Shrimp with their attached eggs, in which eggs the fishermen could clearly see the already formed embryos, eyes and all.

It is highly necessary here further to state that the commercial Shrimp which we call usually the Lake Shrimp, White Shrimp or Common Sea Shrimp (its technical name is *Penaeus setiferus*) affords over 95% of our commercial Shrimp fishery, has definite peculiar and now well understood patterns of development.

The Facts

The facts are these. Lake Shrimp breed from the 15th of February to the 15th of September, and a single female may produce as many as eight thousand eggs at a single spawning. The ripe eggs are produced over an extremely unusual range in space and range in time, namely, from the seward shore line to fifty miles offshore, and from the 15th of February to the 15th of September.

It is clearly established by these researches, and completely sustained by subsequent investigations, that these eggs, which are only one one-hundredth of an inch in diameter, are discharged immediately by the female into the sea water and are not carried by her as are the eggs of the River Shrimp, the Crayfish, the Crab and the Florida Lobster. Thereafter, these eggs, which hatch within fifteen hours into an extremely primitive larval form, undergo rapidly thirteen changes until they assume, at the length of one-twelfth of an inch, the appearance in miniature of their parents. Strangely, but perfectly truly, these young

Shrimp grow up only in the inshore waters. If they remain at sea, they die. Incapable of swimming because of their feeble powers, they are brought by currents into these nursery grounds which include bays, bayous and certain other sheltered areas,

The important point is that there is no way that a purse seine could possibly catch these minute Shrimp. Furthermore, there is no way that the economic operation of a purse seine could destroy the nursery grounds for these Shrimp. Furthermore, these nursery grounds are of profound importance for many species of fish and other highly valuable seafoods, i. e., for example, the Spanish Mackerel, the Redfish, the Speckled Trout (not really a Trout), the White Trout (better called the Sand Trout), the Kingfish, the Black Drum and the Sheepshead, the Blue Crab (our commercial Crab) for which we have on the Gulf Coast the highest potential production in the entire United States, and the Oyster. Not one of these young stages of these immensely valuable marine resources can be captured or damaged by the use of a purse seine.

The use of the Menhaden purse seine does not disturb these nursery ground conditions and its use is quite incapable of capturing the young of the highly important game and commercial fish, Shrimps, Crabs and Oysters themselves. This fact is in sharp contrast to the damage done by certain other types of fishing gear to such nursery grounds. The Menhaden fisherman who would use his highly costly gear in such a manner that such use would destroy the nursery grounds would so heavily damage his gear that he would very quickly be driven out of business.

The problem also involves the place of Menhaden as a source of food for game fish and for other commercial fish. Pearson and Gunter examined six hundred stomachs of Speckled Trout and Red Fish taken over a period of two years and found that less than two dozen Menhaden were present as food. Most recent work done under the direction of Baughman by Robinson provides the following striking facts:

First, Menhaden were fairly abundant at the time these investigations were conducted. Second, the species were seldom taken. In the stomachs of only two Kingfish and two Sharks out of four hundred and five fish examined were Menhaden found.

The fish thus examined were taken by beach seining and by hook and line fishing. Robinson's figures follow showing the certainly startling subsequent fact that out of a total of two thousand nine hundred and seventeen fish stomachs examined, including all sport and commercial species of interest, only seven Menhaden were found. Particularly significant is the fact that out of one thousand two hundred and forty-four Speckled Trout stomachs examined, only two contained Menhaden, out of three hundred and ninety Redfish stomachs examined, none contained Menhaden, out of one hundred and seventy-three Mackerel stomachs examined, none contained Menhaden, and out of sixteen Tarpon stomachs examined, none contained Menhaden.

The complete tabulation follows:

Species	No. Stomachs Examined	No. Menhaden Found
Speckled Trout	1244	2
Redfish	390	0
Gafftop Cats	213	1
Whiting	198	0
Mackerel	173	0
Dolphin	123	0
Sand sharks	123	2
Sand trout	121	0
Hardhead cats	84	0
Red Snapper	82	0
Kingfish	64	2
Jackfish	29	0
Drum	24	0
Tarpon	16	0
Flounder	13	0
Pompano	12	0
Spadefish	7	0
Sheepshead	2	0
Total	2917	7

Studies conducted by James L. Peck and published in two papers concerning the Squeteague or Common Weakfish of the East Coast (a species differing in habits from the Speckled Trout but related thereto) also fail to indicate any important role played by the Menhaden in the food of the species and further indicate that the Squeteague showed its preference for other "herring-like" fishes than the Menhaden when such other "herring-like" fishes were present.

Recommendations for Menhaden fishing control might well be in order.

That an intermittent and completely unannounced check be conducted by competent persons of the Louisiana Department of Wild Life and Fisheries, and that some representative of the sportsmen's and other commercial fishermen's interests be present at least occasionally on such unheralded checks on the Menhaden catch and that such representative be provided with a transcript of the record of the examination of the catch for his own use, and that he be asked to follow most closely every step in such examination of the day's Menhaden operations. This, the writer believes, would be one of the most effective ways to establish the absence of damage by Menhaden fishing to game fish and other commercial interests. Any possible criticism that such inspections were made in collusion with the Menhaden fishery operators should be by careful planning completely eliminated. I know of no more effective way in which persons not familiar with the gear, operation and handling of the Menhaden catch can more quickly realize the fact that Menhaden fishing does not damage game and other commercial fish. I should further recommend that two co-ordinated activities be directed toward the control of the Menhaden fishing in the State of Louisiana.

That there be required from every Menhaden operating plant monthly a sworn statement providing the following information:

(1) The total number of Menhaden taken.

(2) The number of game and other commercial fish taken.

(3) A precise statement of the number of Menhaden taken but not processed because of plant failure or because of other reasons. It has been the observation of the writer that occasionally inadequately equipped plants through machine breakdown not only are capable of wasting the Menhaden that are caught but also by the discarding of these fish can cause local thoroughly justified complaints.

(4) The production of oil and the production of other Menhaden products.

This information, which should be held as confidential, will greatly aid the Louisiana Department of Wild Life and Fisheries in keeping check on the productivity and efficiency of the Menhaden industry. Such information will also serve to bring about a broader realization of the great value of the economic resources that the Menhaden industry harvests. As indicated elsewhere, the Menhaden industry outranked in volume of production all the other fifty-seven listed fishery industries of the United States and Alaska, reaching, in 1947, a total of 948,155,592 pounds. The value of this catch is not presently available but some clear idea of its value can be reached when it is realized that the 700,000,000 pound Menhaden catch of an earlier recent year was worth $11,000,000. Menhaden production in the Gulf of Mexico contributes heavily to this volume. The last catch statistics for the Gulf of Mexico covered the year 1945 and totaled 64,505,700 pounds. Unofficial statistics indicate that two Gulf of Mexico Menhaden reduction plants alone, one in Mississippi and one in Louisiana, produced in a single year 143,000,000 pounds, approximately two and one-third times the total Gulf of Mexico production figures officially reported for 1945.

Cause No Damage

Menhaden fishing operations using standard purse seines from April 1st to November 30th would not, in the writer's opinion, cause any injury to the propagation of commercial Shrimp or of other commercial fish and of game fish and of Oysters. Young stages of such fish which might have taken shelter in the inshore nursery ground could not be captured by the purse seine gear since such fish are much too small and since, further, the operation of the Menhaden gear would not, in any event, disturb the actual vegetation that forms such shelter. The question of the confusion that has arisen because of the presence of small Shrimp on Menhaden nets (as also the presence on Shrimp trawling nets) has been explained above. It may merely be emphasized again at this point that these small Shrimp are not the young of the commercial Shrimp at all but are actually full grown, sexually mature Shrimp of the kind known as *Acetes*. It should be emphasized again that *Acetes* is of no commercial or other value and that it can readily be identified upon close examination by the presence during the breeding season of attached eggs, whereas in contrast, the commercial Shrimp do not carry their eggs but cast them adrift in the ocean.

There is no evidence whatever to indicate that any reduction of the food supply of game fish and of other commercial fish results from the Menhaden purse seine fishery. This is clearly indicated by, for example, recent observations of Robinson, where his examination of two thousand nine hundred and seventeen game, commercial and other fish revealed the presence of only seven Menhaden. Of one thousand and forty-four Speckled Trout, only two had eaten Menhaden, of three hundred and ninety Redfish, none had eaten Menhaden, of one hundred and seventy-three Mackerel, none contained Menhaden and of sixteen Tarpon, none contained Menhaden.

Earlier studies by Pearson and Gunter, covered six hundred stomachs of Speckled Trout and Redfish taken over a period of two years and revealed less than two dozen Menhaden present as food.

Furthermore, where the Menhaden fishery has been carried on over a period of one hundred years on the East Coast, there is no valid evidence available to show that the Menhaden industry by its activities has caused any decrease in the supply of game fish and other commercial fish or in the food supply for these game fish and other commercial fish. Obvious decrease is apparently ascribable to a complex of other factors among which can be included increased fishing pressures, pollution, etc.

The writer knows of no recognized biologist who, having made an examination of the Menhaden industry in relation to other fisheries industries, is prepared to attribute appreciable damage to the Menhaden industry activities.

The great importance in volume (over one billion pounds per year) and in economic value (far above $11,000,000 per year) of the Menhaden industry and the rapid refinement, due to scientific discoveries, of the Menhaden products at a time when these products, particularly oils and amino-acids are more needed for nutritional uses in the food pattern of the world than ever before, obviously compel highly objective caution before restrictive legislation arising from the misunderstanding of the methods of operation of the Menhaden fishery and the biological part played by Menhaden themselves in the pattern of the coastal waters be damagingly restricted with corresponding vast loss to world needs and to the economic importance of this fishery.

Four species of Menhaden form the basis of the Menhaden fishery, two species on the Atlantic Coast, two on the Gulf Coast. No species occurs on the Pacific Coast. Their ranges and characteristics are here briefly given for the purpose of clearness. The inshore (low salinity) Gulf species was described only two years ago.

Atlantic Coast

Brevoortia tyrannus.

This is the counterpart of the *B. patronus* and is characterized by being very slippery to the touch due to a coating of mucous, as is *B. patronus,* the equivalent and closely related species in the Gulf. This species ranges from Nova Scotia to Florida but not western Florida.

Brevoortia smithi.

Locally called the Yellowfin Shad. The equivalent of the Gulf species *B. gunteri.* Like *B. gunteri* distinguishable by, among other characteristics, being in the case of fresh specimens, not slippery to the touch.

Gulf Coast

Brevoortia patronus.

The large-scale Gulf Menhaden ranging from Appalachicola, Florida to Brazos Santiago, Texas. The ranges of *B. patronus* and *B. tyrannus* are discontinuous although, evidently, they were once continuous. Menhaden have not been reported on the western coast of Florida south of Tampa and *B. tyrannus* have not been reported on the Atlantic Coast of Florida south of "Indian River."

Brevoortia gunteri.

This is the counterpart of *B. smithi.* Ranges north of the Rio Grande, Texas and known at least as far east as Grand Isle, Louisiana. Habitat characterized by waters of low salinity.

One additional note is probably desirable and that is that many smaller Menhaden-like fishes belonging to the same general group of fishes do form important elements in the food of marine game fish and marine commercial fish. These include, for example, the anchovies (species corresponding and closely related to the equivalent anchovies that are so abundantly imported into the United States from Italy and other European producing areas). It is perfectly natural that under these circumstances, sports fishermen often completely mistake anchovies and other close relatives of anchovies as being young Menhaden, which they are not. This has led to the wide and completely incorrect belief that Menhaden form an important element in the food chain of marine game and commercial fish, a belief the falsity of which is completely demonstrated by the study and identification of the fishes forming the contents of stomachs of many thousands of individuals carefully and critically examined.

Tuna

Recent developments that may alter in a far reaching manner the fisheries pattern of the Gulf of Mexico involve the Tuna fishery. Because of the extreme importance of this matter, the following discussion here provides some of the basic facts.

Establishment of the Initial Tuna Fish Packing Operation in the States Bordering the Gulf of Mexico

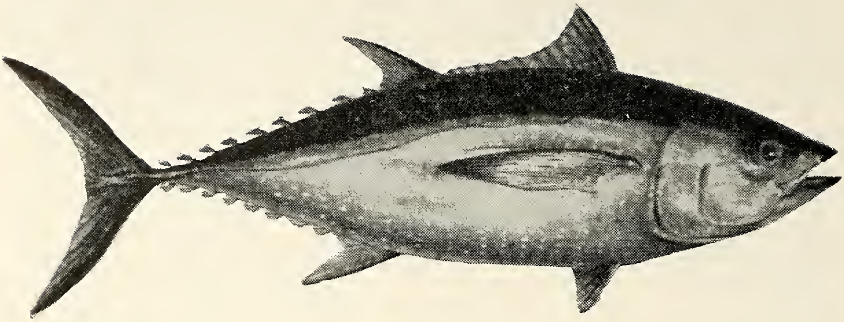
It is the writer's purpose in presenting this memorandum to bring to the attention certain facts concerning:

1. The initiation of the first tuna packing enterprise in the Gulf States.

2. The present rise of the tuna fishery for the first time in history to outrank all other fisheries of the United States and Alaska in value.

3. The unpredictably vast possibilities of the expansion of tuna enterprises and possible transfer of tuna packing from the Pacific Coast to the Gulf of Mexico.

4. The concomitant need for making tuna investigations in the Gulf of Mexico one of the primary targets in any planned program of commercial fisheries exploratory work in the Gulf of Mexico in relation with the operations projected by the Branch of Commercial Fisheries of the Fish and Wildlife Service of the United States Department of the Interior.



YELLOWFIN TUNA. The Yellowfin Tuna is the basis of one of the great fisheries of the world. For the first time, Tuna has outranked all other fisheries in the western hemisphere in point of value, excelling salmon which formerly held that status in the economics of fisheries. (After LeMonte.)

1. The Initiation of the First Tuna Packing Enterprise in the Gulf States.

The writer had a recent lengthy conference with Mr. Cecil W. Drake of San Diego, California and Mr. Joseph S. Martinac of J. M. Martinac Shipbuilding Corporation of Tacoma, Washington, who are chief figures in the establishment of the tuna fishing plant to be operated at Pascagoula, Mississippi under the name Tuna Fish, Inc. The construction of the plant, which will be located immediately across from the city, will probably begin at once. It will be the first tuna packing enterprise on the American side of the Gulf of Mexico.

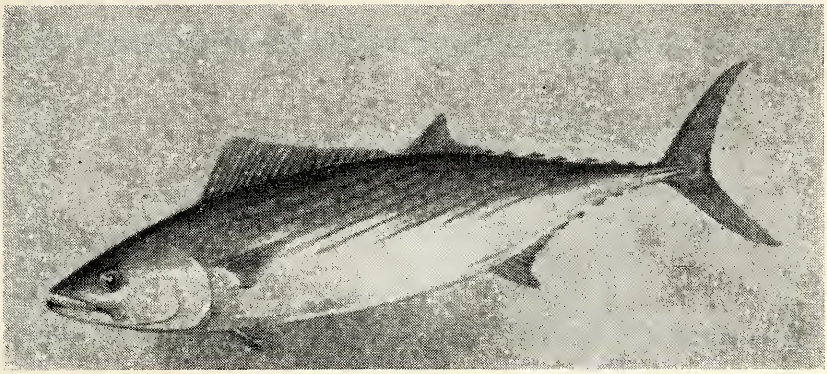
Capital for the plant and working capital will be $600,000.

Initially, five or six boats costing an aggregate of one and a half to two million dollars will operate.

Initially, the plant will employ a shore cannery staff of two hundred and fifty workers.

The fish to be canned will all be obtained from the Pacific fishing areas and brought through the Panama Canal, cutting down the running time at least two days from the fishing grounds some of which are located as far south as south of the equator (the region of the Galapagos Islands) and the boat operations will employ a large number of additional personnel.

It is planned that the initial plant of Tuna, Inc., will be doubled within a period of one or two years and that the number



THE BONITO. The Bonito is distinguished by the oblique lines that mark its pattern in contrast with the False Albacore. The Bonito is one of the many important members of the Tuna group concerning which all too little is known in Louisiana waters. It has an extraordinarily wide range and is of world importance as a sports species.

of boats used will be increased to ten vessels with a value of between three and four million dollars.

The capacity of the initial plant will process forty tons of tuna fish per day, producing daily sixteen hundred cases of forty-eight seven ounce cans.

It should be pointed out that some of the finest tuna boats in the world, now operating from the Pacific Coast, have been built by the Avondale Marine Ways, Inc., New Orleans, these vessels costing from $300,000 to $400,000 each.

2. The Present Rise of the Tuna Fishery for the First Time in History to Outrank All Other Fisheries of the United States and Alaska in Value.

The United States pack of tuna and tuna-like fishes totaled in

1947—5,894,495 standard cases with a value of $90,609,175;

1948—7,037,615 standard cases with a value of $112,610,296.

Tuna and tuna-like fishes, thus, in 1948 for the first time in history excelled all other fishery industries in the United States and Alaska in value, occupying the position formerly held by the salmon industry.

The locations of the sixty-four plants packing tuna and tuna-like fishes in the United States in 1948 were as follows:

2	plants in Maryland
2	plants in Maine
3	plants in Massachusetts
13	plants in Oregon
14	plants in Washington
30	plants in California

The tuna and tuna-like fishes utilized in the American packing industry included:

Albacore
Yellowfin
Bluefin
Yellowtail
Skipjack
Bonito
Mixed Species
Tunno

3. The Unpredictably Vast Possibilities of the Expansion of Tuna Enterprises and the Possible Transfer of Tuna Packing to the Gulf of Mexico.

The tremendous importance of future tuna packing in the Gulf of Mexico can be realized when one surveys the fact that the tuna fishing operations on the Pacific Coast of the United States now involve a capital investment in tuna canneries of between ten million and fifteen million dollars, and a present tuna fishing boat investment serving these canneries of approximately sixty million dollars.

Not alone is the Gulf of Mexico nearer and, therefore, more economical as a base for canning operations than are the present locations of the plants on the Pacific Coast but, furthermore, progressive labor complications have added to the difficulties of the West Coast tuna industries.

The intensity of interest with which this initial project of Tuna, Inc., is being watched by all the tuna fishery enterprises on the West Coast can, therefore, well be appreciated.

4. Gulf of Mexico Tuna Explorations should Be Among Primary Targets.

The value of exploratory commercial fishery surveys has been well demonstrated in the past history of the United States.

It is perhaps of interest to cite one recent example of such exploratory work in Canada where as the result of experimental dragging for flounders in the inshore waters on the western coasts of Nova Scotia, the work being conducted by a research boat of the Fisheries Research Board of Canada, a single private commercial operator, following the discoveries of the investigation, and using an ex-scallop dragger in Kings County, where no winter flounder had ever been taken from 1937 to 1946 and where for the same period the average annual catch of haddock was 7,420 pounds, actually succeeded in capturing in a single month 19,000 pounds of haddock and 76,000 pounds of winter flounder.

The projected program of commercial fisheries exploration in the Gulf of Mexico and the projected program of basic biological research in the Gulf of Mexico to be carried out by the two vessels of the Fish and Wildlife Service will provide the long sought, long hoped for and now to be realized means of making available invaluable information involving the discovery and exploitation of the marine resources of the approximately 750,000 square miles of the Gulf of Mexico, an area in these respects presently almost unknown. The proposal that the research activities of these two vessels will be planned with the full consideration of the suggestions of the newly created Gulf States Marine Fisheries Compact and its biological advisors emphasizes the grave responsibility of utilizing these opportunities in the most productive manner possible.

It is perfectly obvious that the possible translocation of the present West Coast shore tuna fishery activities from the Pacific Coast to the Gulf of Mexico, already under consideration for other reasons, would become greatly more desirable for the tuna industry interests if a source of supply of tuna and tuna-like fishes could be discovered in the waters of the Gulf of Mexico itself, at the very front door of their Gulf coastal canning plants.

THE DELECTABLE BULLFROG. The Bullfrog here shown exhibits the ear drum (tympanum) structure that distinguishes it from the other existing North American Bullfrog that is so much less important in commerce. **(After Toole.)**

Frog "Farming"

Few biological inquiries received by the Department of Wild Life and Fisheries match in number the question, "How can I start frog farming and how much money can I make?" It is the purpose of this discussion to give a compact answer to that question and thereunto to add some statement of the facts now known about the delectable bullfrog. These observations are based upon the writer's personal experience with bullfrogs over a period of twenty-six years covering areas of its range from northern Nova Scotia to the coast of Texas and the more intimate acquaintance with this useful and pompous amphibian in the State of Louisiana for the last nineteen years.

Frog legs are definitely a luxury food, as anyone who orders them in the Waldorf Astoria, Palmer House or the Blackstone will quickly discover. They are a gourmet's delicacy that is, when properly prepared, unique. It is estimated that the annual commercial catch of frogs in the United States is more than three million pounds with a value of approximately one million dollars. Six species of frogs in the eastern United States and three in the western United States are used for food, but pre-eminent among all is the bull frog, *Rana catesbeiana,* that ranges from Canada to Mexico east of the Rockies, and pre-eminent among all states in frog production is Louisiana. A second species of bullfrog, the southern bullfrog, *Rana grylio,* ranges from Louisiana to Florida and south Georgia, but is less important because it is smaller.

The distinction between these two chiefly concerns the appearance of the under surface which in the bullfrog is yellowish-white and in the southern bullfrog shows a pattern of black, brown and yellow, forming an often brilliant network. The much smaller and relatively unimportant northern grass frogs, sometimes used for food, are here omitted from discussion.

Bullfrogs are interesting animals, undergoing a metamorphosis as striking as that of butterflies. They pass through three stages: egg, tadpole and frog, as every youngster interested in natural history knows.

The following discussion will concern the bullfrog since it is the basis of the entire industry.

The sex of bullfrogs can be readily distinguished in two ways; first, the diameter of the eardrum (tympanum) of the male is twice as great as the distance between the nostrils, while in the female it is only slightly greater; second, the thumb of the male bullfrog is much thickened, while that of the female is slender. Bullfrogs have gained their name from their peculiar vocal powers, an extraordinarily loud bellow that gained for them from the Huron Indians of the north the name of "Ouarouaron," the Louisiana-French name for the bullfrog. Lafcadio Hearn once described this as a perfect example of onomatopoeia (the word imitating the natural sound). The cry has been described as being best imitated by roaring the word "rum" down into an empty barrel as deeply and loudly as possible. The frog repeats the sound four or five times at intervals of about a second and then remains quiet for several minutes. The booming of a pond full of male bullfrogs has been reported as audible for more than five miles. The bullfrog has another remarkable sound, described as a "yelping snurp," uttered when it dives when frightened, and a further agonized scream when emitted from its wide open mouth when the frog is captured and in pain.

The mating female lays a remarkable egg cluster that spreads out on the surface to cover two to five feet and contains ten to twenty thousand eggs, each egg being black in one-half of the sphere, cream colored in the other, and surrounded by a clear, jelly-like envelope as much as almost one-half inch in diameter.

Accurate figures regarding present frog production in Louisiana, for various reasons, are not presently available. Some years ago the Louisiana production was given as 715,514 pounds with a value of $107,331.

Bullfrogs have many natural enemies from egg to adult since they are eaten in various stages by many species of birds, snakes and by bullfrogs and other frogs as well.

Bullfrogs have been known to attain a considerable age, one in the London Zoological Garden having lived fifteen years and eight months, while another in New York must certainly have been at least twelve years old.

During the course of their development, bullfrogs have peculiar changes in food, the tadpole stage being strictly vegetarian, whereas the transformed frogs eat only animal food—insects, crayfish and such extraordinarily diverse vertebrates as fish, frogs, salamanders, young turtles, snakes, moles, mice and birds. Sometimes their prey may weigh a third as much as themselves, one bullfrog, for example, containing a 7-inch bullhead catfish.

The Louisiana regulations for bullfrog conservation include a closed season during their breeding time and an ordinance that prohibits the use of any instrument in capturing frogs that will pierce the frog's skin. This prevents the loss of injured animals.

The question now concerns bullfrog farming.

Bullfrogs, like other frogs and quite unlike many important species of fish, are not sociable creatures. When confined in numbers in concentrated areas, they have, in the observation of the writer, completely failed to multiply in any satisfactory productive manner. Furthermore, under such artificial conditions of propagation, the great number of parasites and other diseased conditions to which frogs are subject increase beyond control.

It is significant that certain nationally advertised schemes for raising bullfrogs primarily involve the sale at excessive prices of so-called special "breeding stock" which the writer after personal investigation has never found to be any other than ordinary native bullfrogs. These reputedly special strains to the personal knowledge of the writer were not even bred by the people offering them for sale but were simply captured wild native bullfrogs sold at exorbitant prices.

It is also significant that certain of these most widely advertised schemes for raising bullfrogs have been subjected to the severest scrutiny of the United States Postoffice Department with, as a result of such investigations, the indictment of certain of these companies under Federal law for using the mails to defraud. All the bullfrogs that have been marketed have to my knowledge been captured as native animals in the wild state.

Extensive inquiries by the writer have failed to reveal any considerable market in canned frog legs.

The market for frog legs is decidedly a luxury market but they are usually simply processed by freezing. The supply apparently simply cannot meet the needs of the market and on occasion frog legs have been imported into the United States from Cuba.

A sharp distinction must be made between, first, the attempts to rear bullfrogs artificially, and, second, the stocking of areas suitable for natural bullfrog growth. The second procedure may well result in a good crop of bullfrogs under natural conditions.

It is particularly necessary to set forth these facts because as is well known the artificial propagation of many useful forms of wildlife has been eminently successful, for example, mink, game fish and quail. Arguing by analogy, innumerable investors have plunged into enterprises that produced frog farms but produced no frogs. Only by the experimental injection of certain glandular extracts, i.e., those of the pituitary gland, have scientists been able to induce captive bullfrogs to lay eggs, and even then only after a long series of unsuccessful attempts.

The market supply of bullfrog legs in Louisiana as elsewhere must in our present knowledge still continue to be derived from wild bullfrogs grown in their natural habitat.

(The Chief Biologist will be glad to provide any inquirers who wish to experiment with bullfrogs with a list of Louisiana sources from which living bullfrogs may be purchased at current market prices.)

Singletary Peas and Quail

The Commissioner of the Department of Wild Life and Fsheries brought to the attention of the Chief Biologist the necessity of investigating reported instances in which death of quail had been ascribed to the fact that they had eaten seeds of the Singletary Pea, technically *Lathyrus hirsutus,* also known by the other common names of Wild Winter Pea and Rough Peavine. This plant, the use of which was developed by Dr. B. H. Singletary of Louisiana State University, has become an importantly valuable element throughout the Southern and Middle West states.

Since the Singletary Pea is so widely grown in Louisiana, a survey of the known facts and experimental examination of the effects of feeding it to quail was undertaken. The Singletary Pea belongs to the same family as do the familiar Sweet Pea of the flower garden and five other species.

Briefly summarized, the published studies show effects of feeding of Singletary Pea plants containing blossoms and immature seed pods affected cattle, produce a pathological condition to which the name "Lathyrism" has been given. Steers fed for five months on Singletary Pea plants showed no symptoms of poison until the plants had blossomed and formed seeds. When fed on flowering and seeding stages, such steers developed "Lathyrism," characterized by a peculiar type of paralysis and tremors. Later studies on the evidently corresponding substance in the Sweet Pea showed that this poisoned condition was due to the presence of an intoxicant stable when heated (24 hours at 80 degrees Fahrenheit, six hours at 120 degrees Fahrenheit) and capable of being readily extracted by cold water or thirty per cent alcohol. The remaining pea meal from which the intoxicant had been extracted proved harmless when fed to experimental animals. Rats fed with Singletary Peas developed "Lathyrism" symptoms in six to eleven weeks, developing paralysis and spinal curvature, losing weight and dying in from twenty-six to forty-three weeks. With this information as background, it became desirable to ascertain the effects of feeding Singletary Peas to Bobwhite quail. An experiment was very cooperatively carried out by James B. DeWitt of the Patuxent Research Refuge of the Fish and Wildlife Service.

It was revealed that an exclusive diet of whole Singletary Peas killed quail in six days.

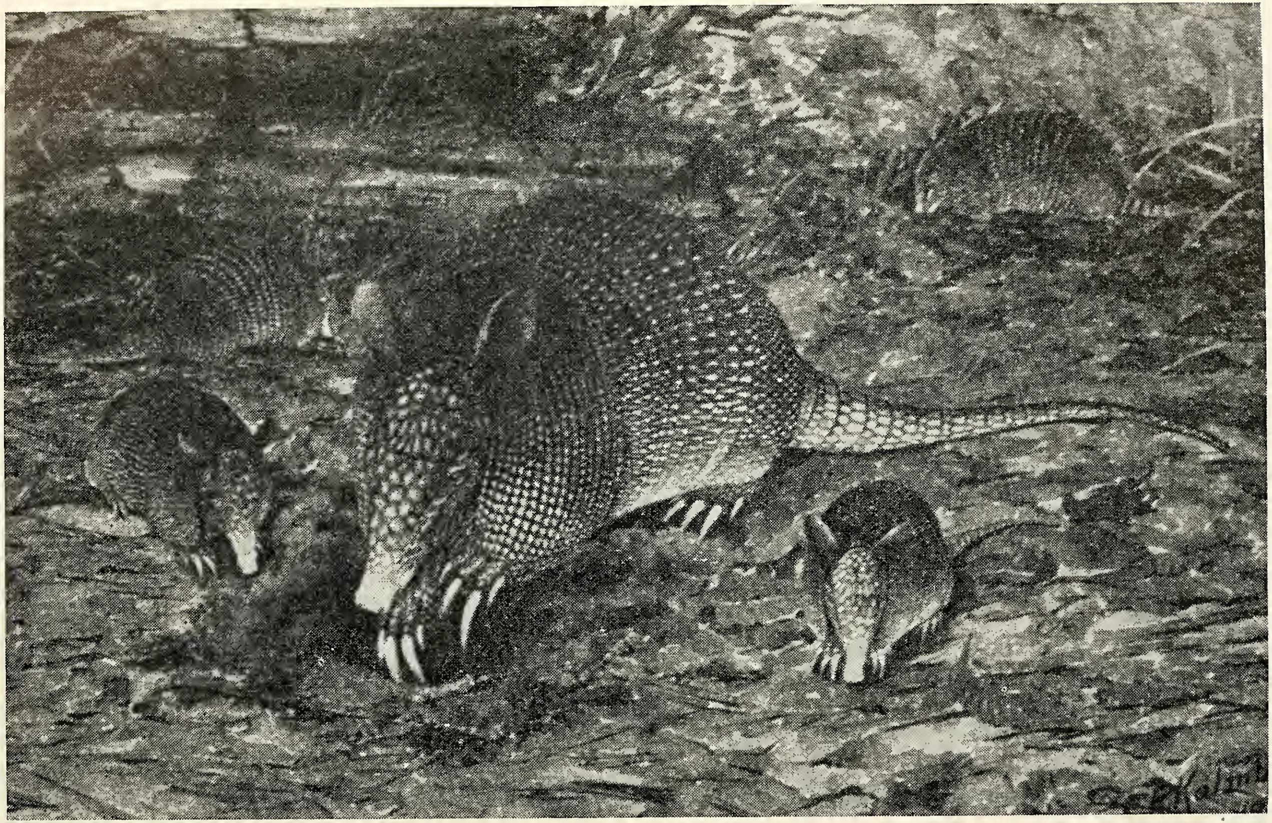
Where quail were offered Singletary whole peas and ground yellow corn in separate feeders, they rejected the Singletary Peas, ate the corn and were normal at the end of twenty-one days.

When quail were fed a maintenance diet containing five per cent of Singletary Peas, they survived.

When quail were fed a maintenance diet of ten per cent Singletary Peas, they remained alive for twenty-one days, but when on the twenty-first day, the diet was changed to one hundred per cent whole Singletary Peas, the female quail in this experiment died within five days and the male, although surviving, had lost weight and had assumed an abnormal appearance.

Quail given a maintenance diet containing twenty per cent of ground Singletary Peas remained alive, merely showing loss of weight.

The results of the preliminary experiments, in which, however, only a pair of quail was used in each diet trial, indicate that there does exist in the seeds of the Singletary Pea a poison-



MOTHER ARMADILLO AND YOUNG. Armadillo ordinarily produce four offspring which are identical quadruplets, the same sex inevitably.

ous substance that is stable and is capable of harming livestock when extensively eaten and of killing quail when eaten exclusively.

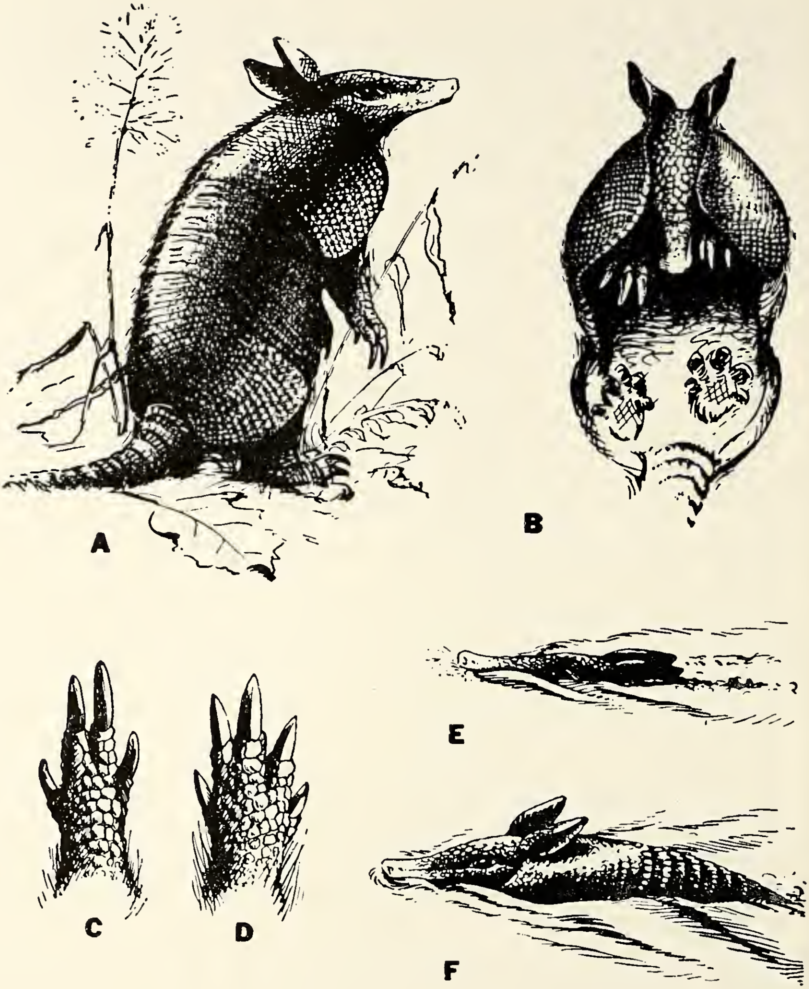
However, in practical terms for the sportsman, there is no reason at present to believe that feeding upon Singletary Peas represents a dangerous hazard for quail for two reasons—first, that the quail appear to greatly prefer other diets and consume Singletary Peas only as a last resort, and, second, that the proportion of Singletary Peas in the diet may be as high as twenty per cent for a period of as long as twenty-one days without causing death of the birds. It is reasonable that under our normal Louisiana conditions, only under the most rare circumstances would quail in nature be compelled for survival to subsist upon available diets that would contain higher percentages of Singletary Peas. The extensive and extremely profitable planting of the Singletary Pea (an operation which is rapidly expanding throughout large areas of the South) cannot apparently be with justice regarded as a danger to our quail populations.

A somewhat prevalent idea that quail poisoning is due to the fact that the quail have fed upon badly stored or "fermenting" Singletary Peas is not sustained by these studies.

The Armadillo in Relation to Quail

The spread of the Armadillo over the State of Louisiana together with its spectacular appearance and nocturnal activities has rapidly aroused the suspicions of Quail hunters that this animal is a serious predator of Quail. Very complete surveys of the food habits of the Armadillo, performed by qualified scientists of the Federal and various State Governments, has completely failed to sustain this charge against the Armadillo. Furthermore, this view is sustained by careful field surveys and interviews with farmers and hunters conducted by the Chief Biologist throughout the entire state.

Facts established are that 99.3 per cent of the Armadillos' diet consists of animal food of which 77.6 per cent consists of insects, many of them destructive species and, particularly, the two Louisiana species of true fireants which are serious Quail enemies. These fireants enter the pipped eggs of Quail and



NINE-BANDED ARMADILLO. (A) Sniffing for enemies or food. (B) Head rectracted for protection. (C) and (D) Powerful right fore and right rear foot. (E) First swimming position. (F) Swimming position after gulping air. **(After Kalmbach.)**

destroy the young before they are able to hatch. They are difficult to control because they form small rather than large colonies, but are avidly sought by the Armadillo.

The term "fireant" in Louisiana, usually is applied to a completely different insect which is the size of a wasp. They are actually the wingless females of several species of solitary wasps, brilliantly conspicuous because of their scarlet color and velvety appearance, rapid in their motions and painful because of their bite.

It may be of interest to sportsmen to know that the Armadillo because of its lack of hair, cannot, like other mammals, trap air in its fur and thus enable itself to swim readily. It follows a completely different procedure. Swallowing air, it transforms its stomach into a waterwing and is then able to maintain its nostrils above the surface.

Armadillos, although innocent of any but negligible destruction of the eggs of young or game birds, and also of assistance in controlling many noxious insects, nevertheless do often cause heavy damage to lawns, to trees used in landscaping and to levees by their industrious and powerful burrowing activities. Their reproductive success is great and they should not, in the opinion of the writer, be afforded any protection. Their numbers in some Louisiana localities are astoundingly high. Their numbers can probably be best reduced by deliberate specific hunting operations.

Pheasants

The spectacular increase of imported Pheasants as game birds in the Northern states, where in a single state in a single year as many as several million of the birds are shot, has naturally aroused the profound interest of Louisiana sportsmen and has even led to the severe criticism of the Department that they have failed in their duty by not importing and propagating these birds.

This criticism has been rendered more acute because of the fact that a successful enterprise has developed in Mississippi whereby Pheasants artificially reared are offered to hunters on a paid daily bag limit basis.

A brief explanation is, therefore, in order.

The present range of the Ring-necked Pheasant appears to extend only about two hundred miles south of the edge of the glacial terrain east of the Rockies and west of the Rockies as far south as the Willamette Basin south of Portland.

The rearing of Pheasants in the wild in Louisiana has been attempted not only by the former Department of Conservation (which then included game resources) but also by private individuals but never with success. The factors which limit the reproduction of Pheasants under natural conditions are obscure but may well be associated with certain external parasites such as ticks and mites, common in many of these areas.

The fact remains that Pheasants when turned loose in Louisiana simply do not reproduce nor do they long survive. The isolated successful shooting enterprises that exist are not practical as State measures since the birds require rigid care until they attain development and as far as is known fail to nest in natural habitats. This may seem a most mysterious matter to the layman since, as he may have observed Pheasants in Illinois where they have become so over-abundant that they constitute a pest to the farmer, he naturally cannot understand why under what would seem to be ideal conditions of temperature in Louisiana, these birds fail. Such, however, is the case based upon repeated attempts to reproduce them.

Control of Grasses in Relation to Game Management

Preliminary special experiments were carried out by the Chief Biologist with the cooperation of the Dupont Company concerning the control of highly resistant land grasses, such as Johnson, Bermuda and Quack grasses, involving the use of a newly devised chemical designated on the market as Dupont 60% Sodium TCA Weed Killer, or simply TCA. Technically it is the Sodium Salt of Trichloroacetic Acid.

This new chemical offers great value in its use as supplementary to other weed control activities in wildlife management.

It possesses two most useful characteristics. First, being non-combustible, it consequently presents no fire hazards and, furthermore, unlike Ammonium Sulfamate which sterilizes the soil for extensive periods of time, TCA quickly loses such sterilizing influences. The action of this chemical is extremely severe but disappears within thirty to ninety days depending upon the amount of precipitation.

Parrot Inquiries

A great deal of the time is lost by people who are either importing Parrots as an enterprise or are simply bringing Parrots in as pets on returning to the United States from South America or elsewhere abroad and suddenly find that these pets must be cleared before they are permitted to enter the country.

Repeatedly, such people, thoroughly bewildered, have sought out the office of the Chief Biologist, and it is for this reason that these facts are here set down.

Parrots (including Parrokeets, the love birds of Australia) are forbidden entry into the United States unless they are accompanied by a health certificate. The extremely serious reason for this regulation is that these birds transmit a dangerous, often fatal, human disease known as Parrot Fever (Psittacosis).

The Department of Wild Life and Fisheries has nothing whatever to do with the enforcement of this regulation. The necessary clearance certificates are issued by the Louisiana State Department of Health, in the Civil Courts Building, to whom application must be made.

Terrapin

The Diamond-Back Terrapin is a native of Louisiana but its numbers greatly declined as has also its market value. Although thirty years ago it commanded in New York a fabulous, luxury value, fashions in food changed, and it is now greatly fallen inprice. However, it is none the less delectable and none the less prized by gourmets.

The Federal Fish and Wildlife Service operating the Fishery Station at Beaufort, North Carolina carried on Terrapin studies and the culture of young Terrapins for planting over a period of the last fifty years. These activities have now ended because of the transformation of this Biological Station into a specific center for research on the food and growth of oysters and other mollusca by procedures using radioactive isotopes to feed the microscopic organisms (plankton) upon which shellfish feed. Subsequently, the paths of these radioactive ingested foods during the course of their transformation into the actual body structure of the oyster or other shellfish can be readily traced.

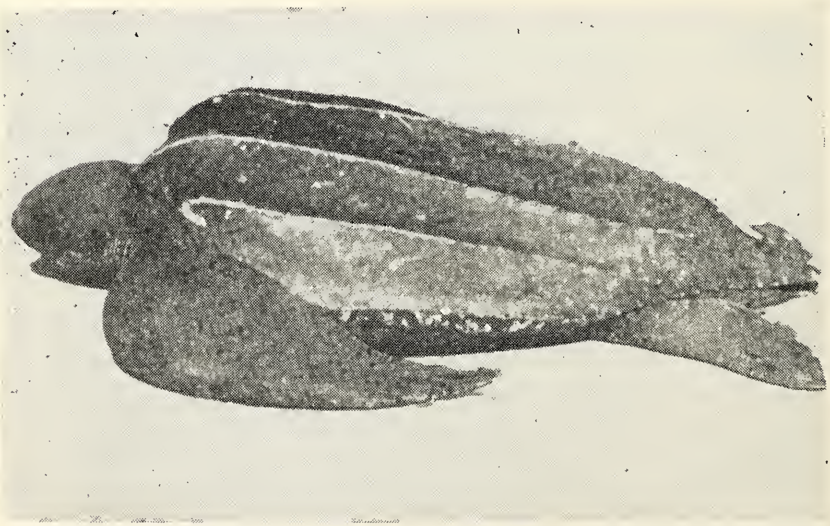
Last year, the Chief Biologist received from the United States Fish and Wildilfe Service, fourteen hundred year-old Terrapins which were dispersed throughout appropriate areas in the coastal waters of Louisiana. With the closing of that station, the Chief Biologist received an additional five hundred baby Terrapins which are being similarly released in natural brackish water Louisiana habitats.

Terrapin grow very slowly, an inch a year in length, thus requiring seven years to attain their adult size of a seven-inch shell.

Already, the writer has received reports of the success of plantings which were made last year.

Leather-back Turtle

An exceptional specimen of much scientific interest was brought to Louisiana December 6, 1949 by Captain Harvey Seymour, Edward Trochesset and Ira Letort after its capture by Captain Joe Horney while shrimp trawling. The writer was



HUGE SEA TURTLE RARE IN LOUISIANA. A cosmopolitan tropical species which sometimes wanders out of its real home, the Trunk Turtle has twice in the experience of the writer invaded Louisiana. The picture of it is here reproduced so that shrimp fishermen or other operators in the Gulf of Mexico will recognize it and by turning in these specimens will add to our scientific knowledge of the Gulf of Mexico. **(After Ditmars.)**

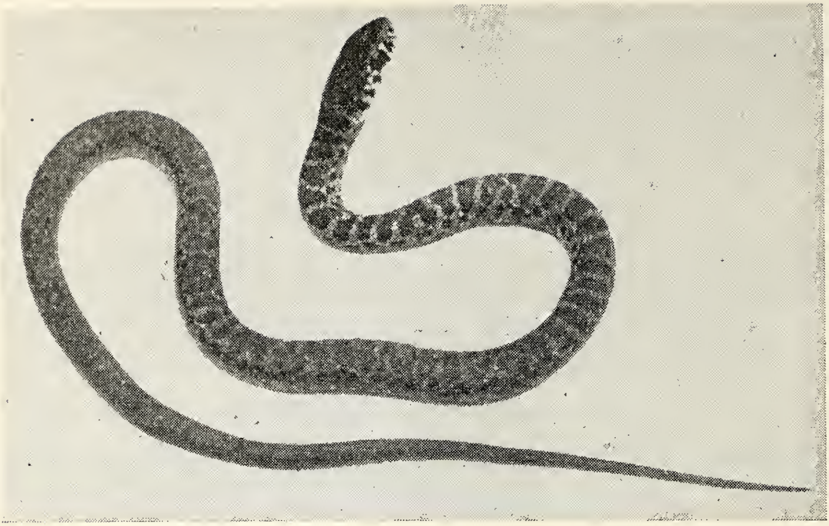
called upon to make a scientific examination of the specimen and technical identification of it. This remarkable animal is an inhabitant of tropical waters of the world and this individual happens to be the second specimen that has come to the attention of the writer during nineteen years of study of Louisiana waters. The other specimen, taken in a shrimp trawl off St. Mary's Parish, survives in the form of a cast in the Department of Wild Life and Fisheries Museum in New Orleans. Known as the Leather-back Turtle, Trunk Turtle, Harp or Luth Turtle (technically *Dermochelys coriacea*), this species is one of the group of cosmopolitan sea turtles of which the commonest Louisiana species is the Kemp's Loggerhead Turtle.

The Leather-back, as shown in the illustration, has a most peculiar back shell (carapace) which instead of being marked by jigsaw-like segments exhibits long pronounced fore and aft ridges. Dark brown, sometimes yellowish, and when very old black, it is the largest living turtle in the world and its appearance anywhere is a matter of scientific interest. It lands only to lay its eggs, the nearest breeding point to Louisiana being the Dry Tortugas in Florida. It ranges as an extraordinary visitor as far north as Connecticut and as far south as Brazil. A closely related species occurs in the Pacific. Remarkable in its swimming ability, it has been known to attain the fantastic weight of eighteen hundred pounds.

Control of Snakes

The writer receives constant inquiries and inquiries accompanied by specimens concerning snakes. The Department has available a publication describing and illustrating the poisonous snakes of the State and the measures necessary to be taken in the treatment of snake bite. Snake problems fall into two categories.

First, the extremely frequent appearance of snakes near human dwellings, even in the midst of large cities such as New Orleans. It has been the experience of the writer that in the large cities the commonest snake brought in for identification is the young of harmless "racers" which in their adult stages are known as the Black Racer and the related Blue Racer, when common racers assume black in one species and "blue" in the other species coloration. They may become large snakes attaining



THE CONFUSING YOUNG OF THE HARMLESS COACHWHIP. The young of the Black Racer and of the Coachwhip Snake are brought more frequently to the writer than any other snake species. Because they are black or completely otherwise dark colored, they are quite understandably confused with the dangerous, although small, Ground Rattler. They are completely non-poisonous and can instantly be identified because they lack the broad jaws of the Rattlers, the Coperheads and the Water Moccasins. **(After Ditmars.)**

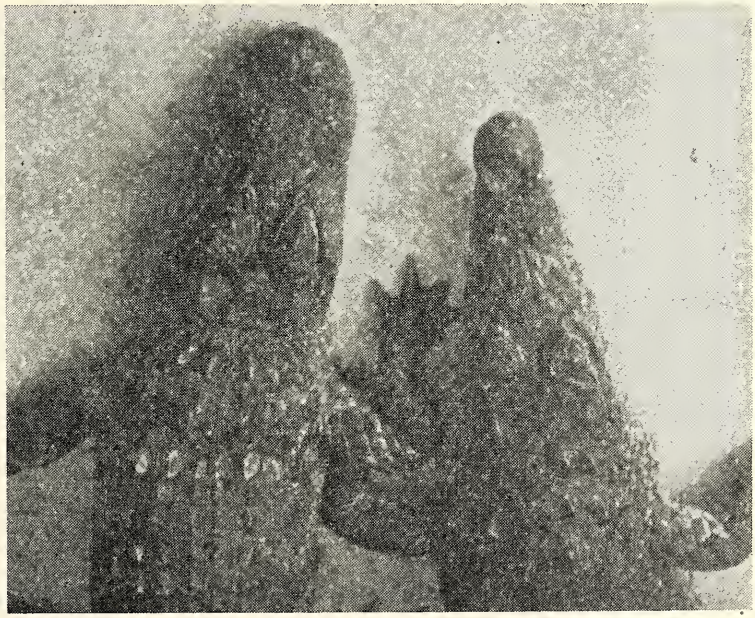
as much as seven feet in length, but they are completely non-poisonous and are only harmful when they steal eggs and chickens. When young, the Black Racers and Blue Racers have a completely different appearance and these are the individuals most frequently brought in to the Department of Wild Life and Fisheries for identification. Instead of being uniformly dark, they are pale gray above with large brownish blotches and very numerous small black spots on the sides. Since a single female can lay as many as twenty-four eggs under a rosebush, the appearance of the subsequent twenty-four snakes on the back lawn creates extreme alarm but they may be instantly identified as being non-poisonous because of the fact that unlike the poisonous snakes (with the exception of the brilliantly colored Coral Snake), they do not possess the lance shaped head and narrow neck exhibited by the Rattle Snakes, the Copperhead and the Water Moccasin.

The Coachwhip Snake, closely related but likewise often invading even central city areas, is equally harmless.

Alligators and Crocodiles

The Chief Biologist has frequently been called upon to investigate reported captured specimens of the Crocodile. Most of the casual, and even quite interested amateur naturalists, do not realize that an American species of Crocodile *(Crocodylus acutus)* does occur in the United States. This species ranges from South Florida through tropical America. The nearest authentic specimen is recorded from Mobile, Alabama.

The Alligator *(Alligator mississippiensis)*, still a common animal in Louisiana and protected in other than the coastal parishes, occurs from North Carolina to Florida, Oklahoma and Texas.



ALLIGATOR AND CROCODILE. Although few people realize that there actually exists a North American species of true crocodile, such is the fact, The writer has received numerous reports of the presence of the crocodile in Louisiana but upon examination each instance has proven to be a specimen of our common alligator. The illustration shows the rounded nose of the alligator on the left and the pointed nose of the crocodile on the right. Apparently, the nearest authentic record of the crocodile is from Mobile, Alabama. Any specimens of crocodile taken in Louisiana might well be of high scientific interest. These two reptiles differ completely in temperament, the crocodile being one of the most vicious reptiles in the United States and, furthermore, capable of running rapidly with its body raised above the ground, a feat which the alligator cannot perform.

The capture of the Crocodile in Louisiana would be a matter of quite considerable scientific interest and it is for this reason that there is herewith reproduced a photograph of the heads of these two animals showing the broad rounded snout of the Alligator as contrasted with the sharp snout of the Crocodile. Study of this illustration will save a lot of trouble since the person capturing such specimens can with certainty identify them.

Spiders

The fortunately only occasional instances of persons being bitten by the Black Widow Spider still arouse great alarm concerning this species and innumerable innocent spiders are brought into the office of the Chief Biologist for identification. Most of these submitted specimens are harmless cobweb spiders, *Theridiiae.* For this reason, the description of the conspicuously different Black Widow is here given, together with a description of its characteristic web. The Black Widow is definitely a dangerously poisonous animal but systematic examination of private premises for the presence of these animals or the webs can reduce such hazards to a minimum. The matter is included here because inquiries regarding the animal, which is abundant in the New Orleans area, never decrease in volume.

Fortunately, the Black Widow is not an aggressive creature and bites human beings under exceptional, usually accidental, conditions such as having been entangled and crushed in clothing.

Black Widow females are the dangerous individuals, since the males, possibly because of smaller size and weaker mouth parts, have not been known to harm man.

The adult female Black Widow is unmistakable in appearance. Shiny black, with a highly globular and relatively large abdomen, she has rather long, slender black legs. The color pattern, although somewhat variable, is highly diagnostic. Typically there is present on the under surface of the abdomen a conspicuous bright scarlet hourglass, together with one of more circular scarlet spots in the neighborhood of the spinnerets. A variation frequently observed by the writers is the presence of a longitudinal row of three or four circular scarlet dots along the dorsal mid-line of the abdomen. Baerg reports the occurrence of completely black adult females lacking any trace of scarlet marking. The adult female Black Widow measures about half an inch from the tip of mouth parts to the tip of abdomen, but may, in normal standing posture, show a spread from front feet to hind feet of two to three inches.

The male Black Widow is about half the size of the female, and displays a much different coloration. Considerable variation occurs. A typical pattern shows three pairs of lateral, oblique yellow to golden bands on the upper surface of the abdomen, together with additional straw colored markings. The ventral scarlet hourglass is present. The legs are marked with alternate yellow and black.

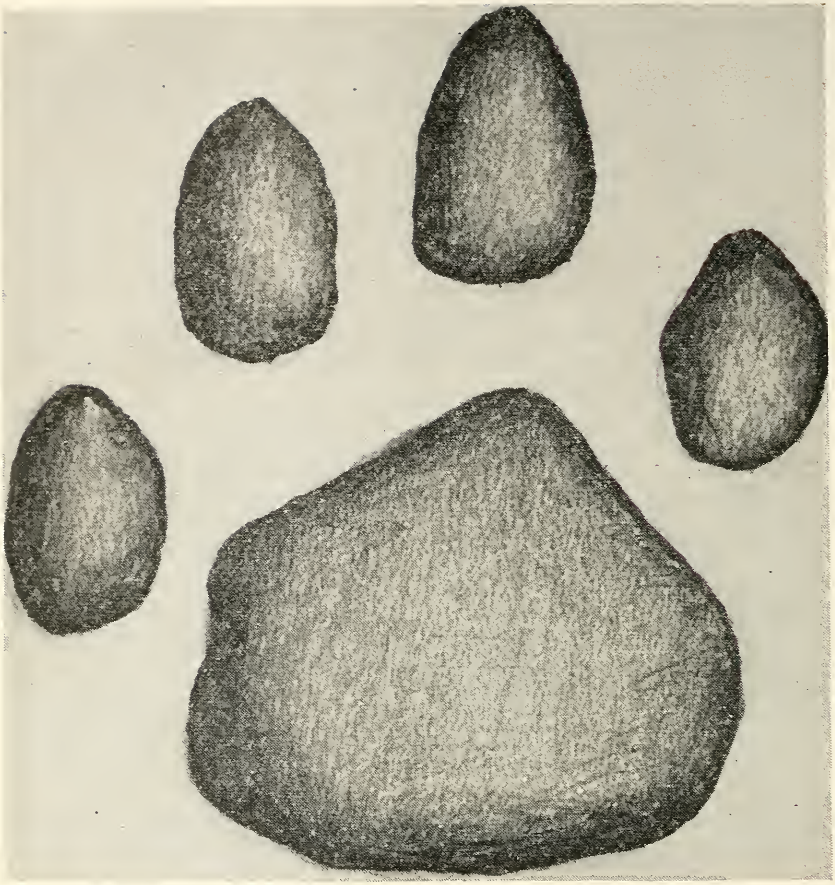
The web of the Black Widow is distinctive and useful as an index of the presence of the species. Loosely woven and irregular so that scarcely two of the coarse strands lie in the same plane, the web is unusually strong. A simple test to distinguish between the web of the House Spider and that of the Black Widow is to stroke a straw through the structure. The web, in the case of the House Spider, will break without bending the straw, but in the case of the Black Widow the straw will bend or break before the web gives way. While usually rather small and in a sheltered place, their webs may often extend as much as six to seven feet, and may be entirely in the open.

The Black Widow captures in its tough web the wide variety of insects and other animal life upon which it feeds.

Puma

The Puma, also known as Mountain Lion, Panther and Painter, is the largest unspotted member of the cat family in North America. Dr. George Lowery has reported the most recent record of the occurrence of the Puma in Louisiana during the fall of 1939 when two were observed on a freshly killed pig between Robeline and Spanish Lake in Natchitoches. The writer, therefore, herewith reproduces in full size a drawing of a Puma's footprint taken and recorded in Natchitoches Parish on the 6th of July, 1949.

The details of this observation are given in the cut underline of the illustration.



FOOTPRINT OF A PANTHER. Herewith shown in original size is the footprint of a Puma. This cast was made by Mr. Joe Miller, head of the Predator Control Unit of the Department of Wild Life and Fisheries, on July 6, 1949 in the Kisatchie Forest. Dr. George H. Lowery, Jr., provides a record from Natchitoches Parish as follows: "Hays states that reliable persons reported seeing two Cougars feeding on a freshly killed pig on the highway between Robeline and Spanish Lake, in Natchitoches Parish, during the fall of 1939. If this record is authentic, it constitutes by far the most recent occurrence of the species in western Louisiana where generally the species has been nearly if not wholly extirpated." **(Original drawing by Miss Eleanor Fairman, Artist of the Museum of the Department of Wild Life and Fisheries.)**

It is of interest to note that this imprint precisely coincides in shape and in measurements with the illustration of the corresponding Puma footprint presented by Dr. Stanley Young in his monographic volume, "The Puma, Mysterious American Cat."

Salt Water Marsh Raccoon Outlawed

The Chief Biologist was called into consultation regarding an executive order whereby Commissioner Ernest S. Clements on December 5, 1949, outlawed the Louisiana Salt Water Marsh Raccoon *(Procyon lotor megalodus)* in the eleven coastal parishes of Louisiana and also in Calcasieu Parish. This is the first time that a fur animal has been outlawed in this State. Characterized by its pale yellow fur, the Louisiana Salt Water Marsh Raccoon is a subspecies of the ordinary raccoon but produces a worthless pelt. It was first described for science by Dr. George H. Lowery, Jr. of Louisiana State University in 1943.

It has become enormously abundant throughout most of its habitat and has been causing very great economic damage in many ways. The removal of all protection from this particular form of raccoon is, therefore, fully justified from a biological point of view. Its abundance may be indicated by the fact that the manager of one of the Federal game preserves (at the mouth of the Mississippi River) shot over two hundred and fifty Raccoons in the immediate vicinity of the Administration Station within a period of two weeks.

A new method of controlling Raccoons has recently been investigated but is still in such an experimental stage that its use cannot be recommended by the Department. This involves the application of a precise chemical technique where only the outlawed Marsh Raccoon is present and where the baits used are specifically for Raccoons. The writer will be glad to discuss the matter with any interested investigators.

Hamsters

Derived from recent developments in the use of laboratory animals has been a rising number of inquiries directed to this office concerning the economic possibilities of the raising of hamsters by private individuals for sale to pathological and other institutions.

The hamster, *Cricetus cricetus*, is a small rodent with a body six inches long that eleven years ago was introduced into the United States from Syria for use as a laboratory animal supplanting in many medical fields guinea pigs, mice and white rats.

Hamsters have been advertised in national publications with the implications that hamster raising can be a commercially profitable enterprise. It is true that hamsters do breed very rapidly, attaining sexual maturity at forty-three days and bearing large litters (sometimes as many as fifteen). It is highly advisable, however, before any heavy investment is made in such an undertaking, a careful investigation be undertaken of possible market outlets of the hamster production. Hospitals and research institutions usually maintain their own supply of experimental animals and since any profitable operation would depend upon market demands and since hamsters are exceedingly prolific, any such commercial projects should be entered upon only after a careful survey of available outlets.

Oil Control in Relation to Shellfish

Reference should perhaps here be made to recent researches whereby surface oil films can be rapidly caused to sink in precise areas. The problem was first attacked as a fire hazard naval and marine problem, but the applications have wide biological significance, also. Information concerning these not widely known procedures will be gladly provided upon request. The first series of experiments were carried out under the direction of the United States Navy and resulted in a technique wherewith "carbonized sand" spread on such a film caused its rapid aggregation and sinking. This work was done as a project of the United States Navy. A second technique developed in England involved the use of "amino coated" sands, the results being essentially similar.

Use of these procedures may be of great assistance in many Louisiana pollution problems.

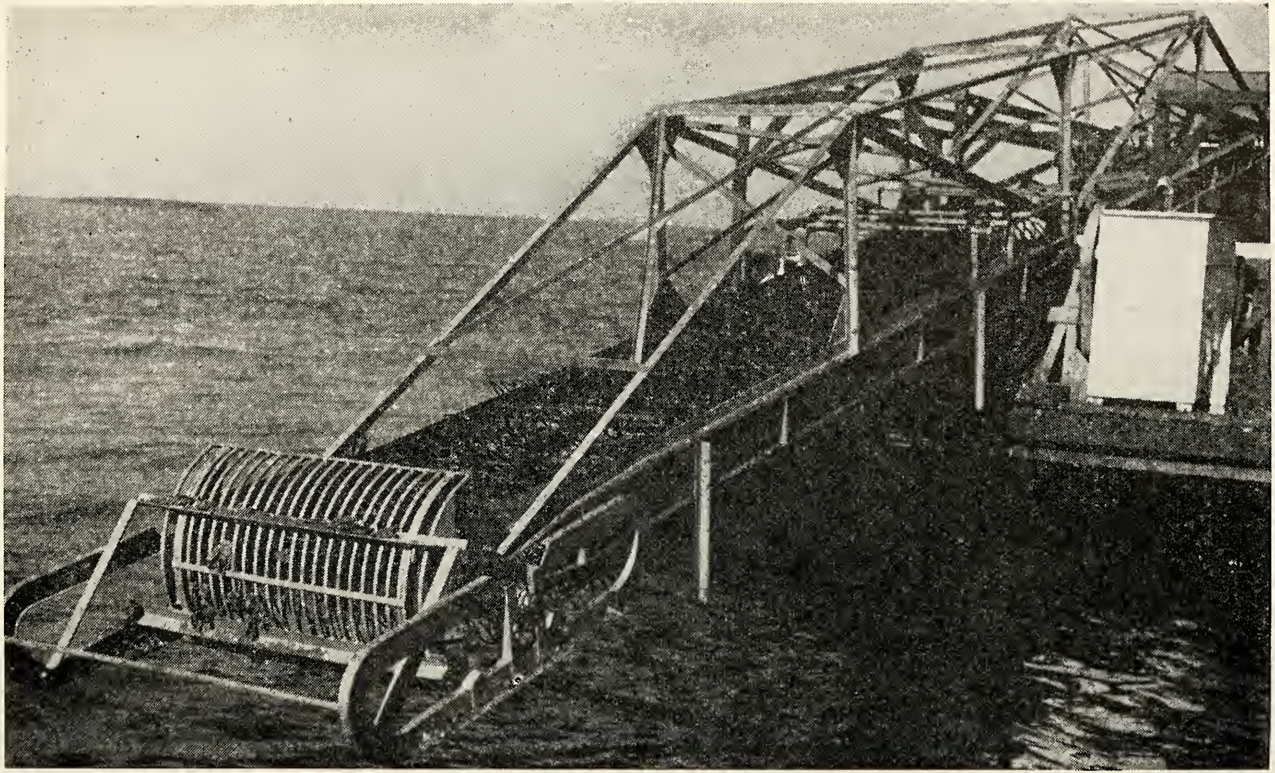
Other Activities

During the biennium, the Chief Biologist served in various capacities in parish, state, national and international activities.

Numerous addresses have been given before various parish sportsmen's leagues and many civic organizations.

Radio and television appearances have been fulfilled and the preparation of articles presenting historical and biological surveys of natural resources have been prepared for the Conservationist, Jefferson Parish Review, for other popular publications and for technical journals.

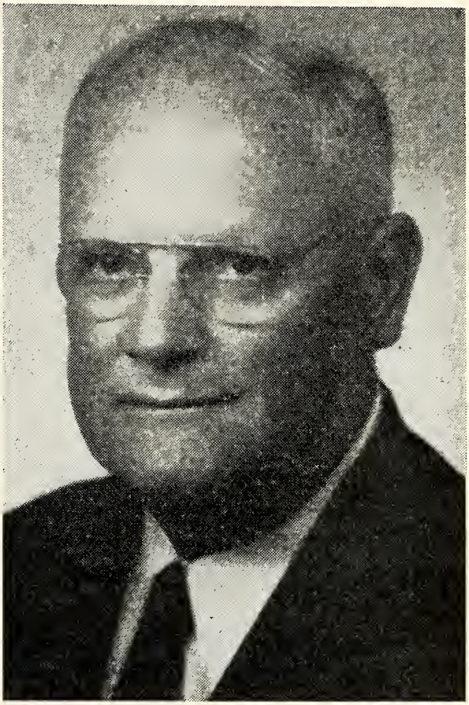
The Chief Biologist has served as Chairman of the International Affairs Committee of the American Fisheries Society, as Chairman of the Marine Resources Committee of the Southern Association of Science and Industry which covers the entire South with a membership of one thousand and as Vice President for the State of Louisiana of the Southern Association of Science and Industry, as Vice President and now President of the National Shellfisheries Association, and as representative of the National Shellfisheries Association and of Louisiana to the first worldwide conference on the utilization and conservation of the natural resources of the world called by the United Nations at their United Nations headquarters at Lake Success, New York. It was attended by some eight hundred scientists from all over the world excluding Russia and her satellite nations (who withdrew at the last moment), this conference provided the opportunity for the first time in scientific history whereby discussion of progress in the preservation, utilization and sustained propagation of fish and game resources of the nations of the world could be cooperatively planned.



Oyster Harvester showing scraper head with slides and conveyor.

DIVISION OF OYSTERS AND WATER BOTTOMS

JAMES N. McCONNELL, *Director*

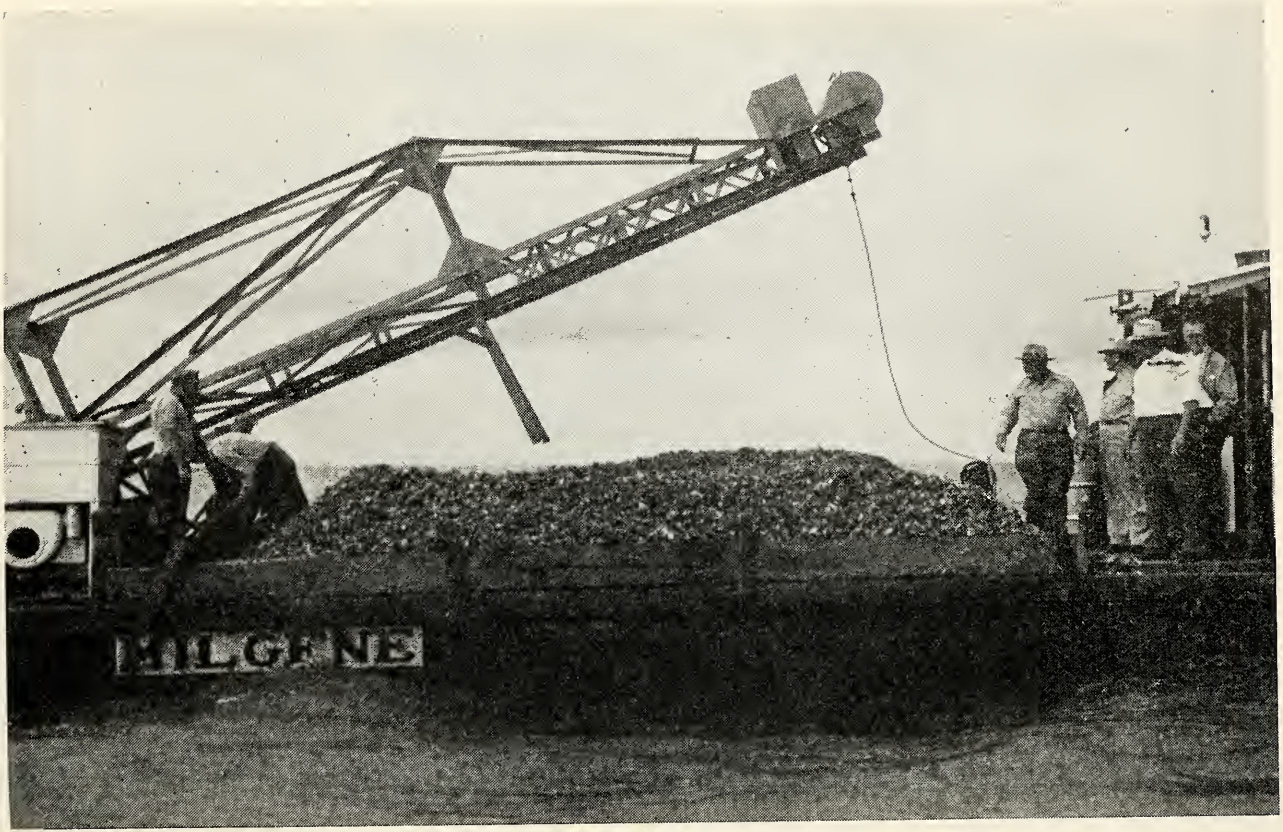


James N. McConnell

During the past two years this Division, in addition to its normal functions of attempting to increase oyster production in Louisiana by shell planting, and the transplanting of seed oysters from crowded reefs to depleted areas, has directed special attention, first, to a biological research program to determine the causes of undue oyster mortalities, that have been occurring in our coastal waters during the past ten to fifteen years; secondly, to our coastal waste control program which has been working continuously to prevent the introduction of pollutants into our coastal waters; and thirdly, to properly supervise the activities of all geophysical operations where explosives are used to locate possible oil production areas.

Other functions of this Division include the surveying and leasing of oyster bedding grounds, the cultivation and patrolling of State seed oyster reservations, and all of the oyster producing areas of the State, and the collection of rentals, licenses and taxes, and royalties on sand, shells and gravel.

A detailed report will follow of the above activities as well as plans we deem necessary to properly protect and increase the oyster industry of Louisiana.



Seed oysters being transplanted by Oyster Harvester from overcrowded reefs to barren areas.

Oyster Life Cycle

In order to acquaint the layman with the reason why shell planting is so necessary for the perpetuation of our natural reefs, a short resume of the cycle of oyster life should be given.

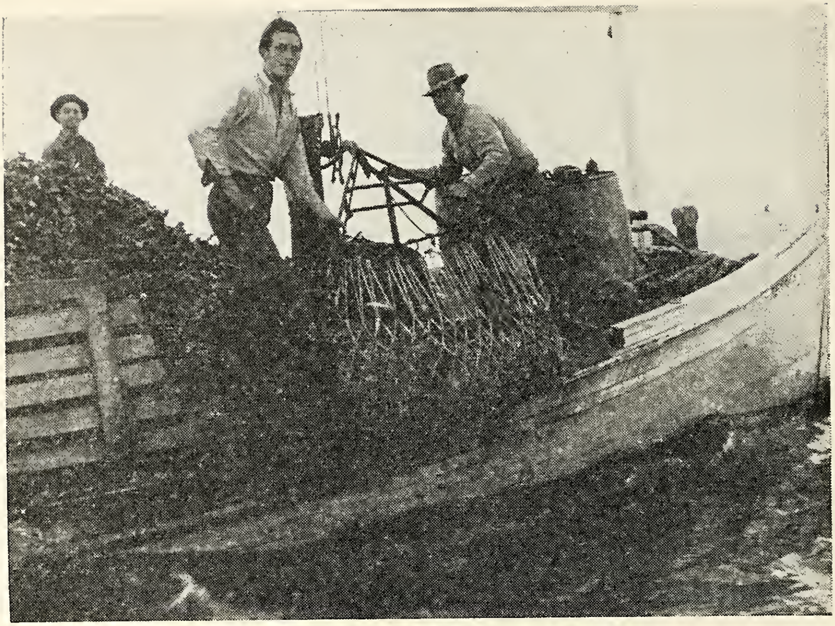
The mature oyster, as we all know, has no power of locomotion, and when it once settles, whether placed by nature or by man, there it remains until removed.

Oysters in this State can be found breeding from March through October, and in isolated cases even during the winter months. Breeding oysters are called "milky" because of the milky-looking fluid which they exude at that time. The milk of the female is composed of millions of minute eggs; that of the male of an incalculable number of extremely small spermatozoa. The milk is cast out into the water where the sperm of the male drifts or swims to the egg and penetrates it. This act of fertilization begins the cycle of oyster life.

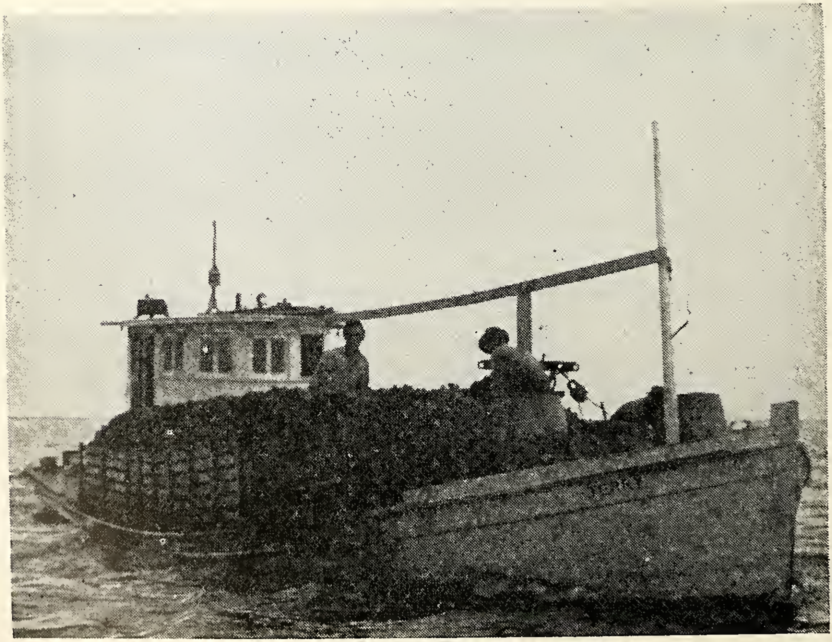
After fertilization takes place, the oyster egg divides again and again, forming a ball of many tiny cells. In the course of a few hours, small vibrating hairs, known as "cilia", appear on the developing young oyster. With these cilia it keeps itself suspended while being drifted about by the winds and currents. Presently, this embryo develops a pair of tiny shells. These shells grow larger and heavier and finally the young "spat" drop to the bottom to attach themselves to some hard object, and forever give up their power of moving from place to place. The young spat can only attach themselves to clean surfaces and after attachment, while still very small, they are easily smothered by sediment.

The oyster, because of its fixed position, is unable to go in search of food, and for that reason nature has so equipped this animal that it is able to obtain its food from the water in close proximity. The tiny, beating hairs in the attached oyster which enabled the larvae to swim about create water currents that carry to this animal the microscopic floating plants which form its principal food.

From the above you will note that when the young oyster spat is ready to "set" and form its permanent abode some hard, clean object should be placed on the bottom to receive the set.



Dredging seed oysters by hand.



Load of seed oysters dredged from east of the Mississippi River.

From experiments in Louisiana, either steamed or sun-dried oyster shells, planted on bottoms hard enough to support the shell and the additional weight of the growing oysters, have been found most desirable for this purpose. All oyster spat settling upon mud or clay soon smother and die.

Shell Planting

During the spring of 1948, this Division advertised on two separate occasions, for bids for planting oyster shells for cultch in the State seed oyster reservations at Sister Lake and Lake Felicity in Terrebonne Parish but no bids were received. Since the summer was advancing it was felt that the time had passed for obtaining maximum results so no shells were planted in either of these reservations in 1948.

However, all Mississippi canning plants obtaining oysters from our natural reefs, returned to the water bottoms of Louisiana ten per cent of their catch in either shells or seed oysters. Thus, 19,014 barrels of shells were planted in Mississippi Sound, east and west of Three Mile Bayou in St. Bernard Parish, and 10,618 barrels of seed oysters were transplanted from Black Bay (Nigger Lake) and planted in the vicinity of Bell Pass in Plaquemines Parish.

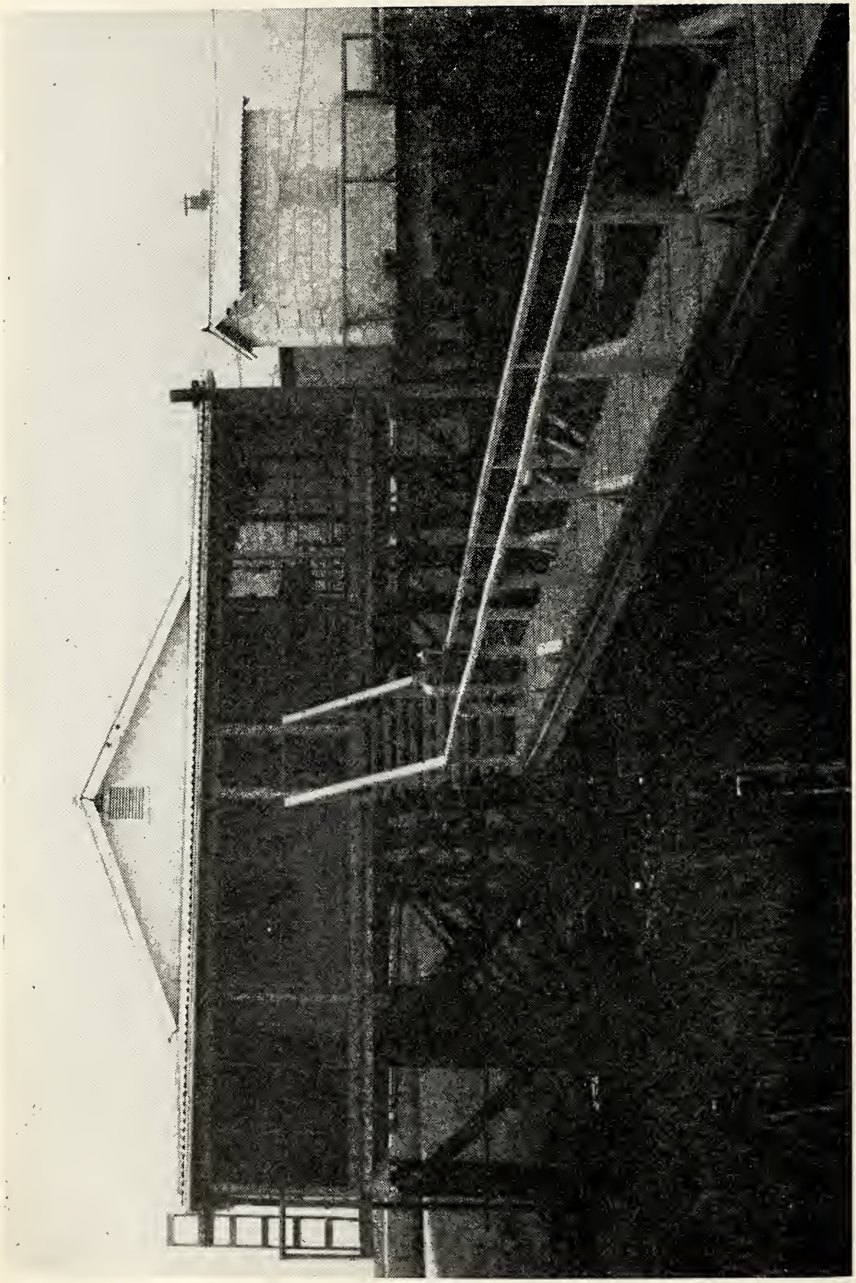
In the spring of 1949 contracts were awarded to the lowest bidder, for shell planting in the State seed oyster reservations at Sister Lake and Lake Felicity, and 21,560 barrels at a cost of 55½ cents per barrel were planted in Sister Lake while 17,539 barrels at the same cost per barrel were bedded in Lake Felicity. The total cost of both plantings amount to $21,699.94.

The oysters from this planting are doing splendidly at this time and an excellent crop will be ready for harvesting by 1951.

Canning plants operating from the natural reefs east of the Mississippi river in the Parishes of Plaquemines and St. Bernard, planted 14,314 barrels of shells in Mississippi Sound, at the mouth of Turkey Bayou, and 8,255 barrels of seed oysters were transplanted from Black Bay (Nigger Lake) and planted in Bayou Le Mere in Plaquemines Parish.

Oyster Seed Grounds

The new watchman's camp at Lake Felicity was completed in June of 1948 at a total cost of $19,800.00, and a man is sta-



New Camp at State Seed Oyster Reservation in Lake Felicity, Terrebonne Parish.

tioned there at all times to see that no oysters are removed from this reservation until the area is officially opened.

During November of 1949 a new oyster reservation has been designated in Bay Gardene in Plaquemines Parish, approximately ten miles east of Point a la Hache. A contract has been let for a watchman's camp in this area and the Parish of Plaquemines is presently dredging the necessary slips and channels to faciltate the oyster harvester operations, which will continue in this area until the available area in the Bay Gardene Reservation has been filled with oysters.

Oyster Planters Forced to Change Methods

All of our oyster fishermen from Plaquemines, Jefferson and Lafourche Parishes west of the Mississippi river formerly transplanted the majority of their small seed oysters during the months of February, March and April, and would not harvest these oysters until they had been transplanted for a period of eighteen months or longer. This required their remaining on the new bed two summers after planting. At that time, because of low mortalities and the use of small oysters for seed, fishermen could reasonably expect to market at the end of this period from one and a half to three barrels for each barrel of seed oysters planted, depending upon the location planted. In some few isolated cases as many as four for one have been harvested.

For the past several years it has become necessary for fishermen in these same areas to transplant their seed oysters from August fifteenth to December first of each year and harvest these oysters before summer, or if they remain on the bottoms during all of the summer months mortalities ranging from thirty-five to as high as ninety-five per cent have occurred. Due to this condition, the fisherman today, in looking for seed oysters, attempts to find the largest oysters that can be obtained from the natural reefs so that they may be harvested before one summer is reached. The result of this practice places a heavy drain on our natural reef areas as the fisherman who formerly used only ten to twenty loads of seed oysters is now using eighty to one hundred and twenty loads to meet his requirements.

This condition has seriously affected our steam canning plants in Plaquemines and Jefferson Parishes, that formerly obtained most of their supply from the natural reefs. Since oysters on these reefs are in their best condition for steam canning from January first to April thirtieth, it is to the best interests of the canning plants that operations do not commence before January first of any year. It can readily be seen what happens to the canners when they open on January first, after the seed oystermen have been searching the reefs for over three months for the largest oysters available in quantities.

The only bright spot in the above picture is that for the past two years the fishermen who take these seed oysters have been selling the great majority of their catch to the canning plants. These transplanted oysters seem to grow and fatten rapidly and when packed by canners in March and April, yield from thirty-five to forty-three five-ounce cans to the barrel, whereas the same oysters left alone on the natural reefs only yield, when packed during March and April, from eighteen to twenty-two five-ounce cans to the barrel. This change in oyster production did not occur rapidly but over a long period of from ten to fifteen years. It was first noted that oysters could not remain through two summers after transplanting without heavy losses, then later it was found that they could not stand one summer after transplanting.

Transplanting Seed Oysters with Oyster Harvester

A new machine for removing oysters from the bottom was invented by a New Orleans man, Joseph M. Jurisich. This oyster harvester can be made to work for the betterment of oyster beds, for the culture of young oysters, for the seeding of new beds, and for the reclamation of shells, as well as for bringing up good oysters, and it can do all this as fast as fifty men could do the same work in the old time method of tonging oysters.

Mounted on a maneuverable barge, which is powered by a Murray and Tregurtha outboard propelling unit, that can be raised or lowered to make it usuable in deep or shallow water, the harvester is a streamlined unit that brings up oysters, shells, clusters of spat, or whatever else is movable on the bottoms of the lake, bayou, lagoon or bay. There is an endless-chain type of conveyor that brings up the oysters as they are fed onto the conveyor by the strong, steel teeth of the rake-like dredge, and there are guard runners on each side of the teeth to prevent gouging or excessively deep digging in the oyster beds.

Sturdily constructed and mounted, the harvester was tested on every type of reef and in all sorts of weather and found to be practical and efficient.

After a trial operation for a one-month period, and after consultation with members of the industry, it was decided to purchase the harvester at a cost of $22,400.00.

From June first, to December thirty-first, of 1949 approximately 26,154 barrels of oysters were transplanted from overcrowded reefs in Mississippi Sound to depleted area in Bayou Gregue, Oyster Bay and in Turkey Bayou.

Biological Research

Research work to determine the cause or causes of the undue oyster mortality, presently existing in Louisiana, has been continued. The scientific staff has been increased and work is being done in the Department's chemical laboratory in Baton Rouge, in addition to the work being done in the U. S. Fish and Wildlife Service's laboratory in Pensacola, Florida, and the Department's field laboratory at Sister Lake in Terrebonne Parish. A report covering these activities will be found in the report of our special biologist which follows.

Coastal Waste Control

Under date of September 9, 1946, the Attorney General's office advised the Commissioner of Wild Life and Fisheries as follows: "The Commissioner of Conservation is no longer concerned with waste from oil wells insofar as that waste affects aquatic life. This is now the concern of the Stream Control Commission; and it is the concern of the Department of Wild Life and Fisheries only to the extent of enforcing the rules, regulations and orders of the Stream Control Commission."

In accordance with this directive, this Division has maintained two small patrol boats with two-man crews consisting of a waste disposal inspector and a boat captain. These boats cover all oil fields in the coastal areas, from Delacroix Island on the east, to Lake DeCade and Dog Lake on the west. These boats are in constant operation, inspecting all oil fields. Each inspector turns in a written report in triplicate upon the completion of his inspection of each field visited. The original report becomes a permanent record of this Division, the second copy going to the Stream Control Commission through its secretary, and the third copy going to the person in charge of the area visited. Each inspector is equipped with a camera for the purpose of taking pictures of violations and polluted areas which may be encountered during inspections. One print of each picture is kept on file in this Division and a duplicate print is submitted to the Stream Control Commission. Thus all parties concerned receive first hand a list of violations as formed by our inspectors and are in a position to know what steps to take and what precautions are necessary in their future operations. The two inspectors turn in their reports to the New Orleans office on Mondays of each week, at which time they receive any special instructions which may be forthcoming regarding any special fields which require immediate inspection.

Our airplane pilots also make reports whenever they spot pollution from the air in any oil field in this coastal area. Our inspectors are constantly on guard to see that all installations are properly maintained to prevent seepage. It is also their duty to see that all possible precautions are taken for the prevention of pollution of State waters.

Special reports are prepared weekly for the Stream Control Commission pointing out violations that must be corrected and calling attention to consistent offenders where special action may be called for.

It is pleasing to note that splendid results have been obtained from these inspections and in most cases cooperation has been given us by the various oil companies involved. Where this has not been done the matter has been turned over to the Stream Control Commission for action. As a result of these activities a marked decrease in violations has been noted.

Seismograph Operations

Seismic operations are carried on under regulations formulated by this Division under the authority of Act 127 of 1912 as amended.

During the year 1948, there were 419 new permits issued, and an average of 88 agents per month were employed, to supervise geophysical operations in areas where damage might occur to the State's natural resources. This was a slight increase over the year 1947. In 1949 a decrease was noted. A total of 392 new permits was issued and a monthly average of 85 agents were employed.

It should be noted that in 1949 practically all of the crews working in the offshore areas moved inland due to the uncertainty of the ownership of the tidelands. Some of these crews are continuing their operations in Louisiana while others have left the State.

Effective April first, 1949, areas that were formerly unrestricted became restricted. This was done at the request of the Louisiana Department of Health, that all holes drilled in geophysical operations be filled before leaving the locations, since leaving such holes may result in contamination of ground water sources used for drinking water, and in such a manner be detrimental to public health. For this reason agents of this Division are assigned to each crew using explosives in geophysical operations in this State.

Aviation Activities

This Division is presently employing one pilot, two mechanics and two amphibian airplanes, a Republic Sea Bee and a Gruman Widgeon, to patrol the entire coastal oyster area. The mechanics employed by this Division also do all work necessary on the two other planes, used by the Enforcement Division.

More than one thousand flying hours were flown during the past two years in patrolling, collecting samples for use in our biological program, checking oil fields for waste, and assisting in rescue operations.

Assistance is always extended to Federal and other State agencies in furthering the work of the Department of Wild Life and Fisheries.

REPORT ON COLLECTIONS
(Fiscal Year)

RECEIPTS

	1947-48	1948-49
Oyster Bedding Ground Rental	$ 27,756.63	$ 30,991.00
Privilege Tax	12,927.12	14,316.87
Tonnage Licenses	1,818.50	1,773.50
Dredging Licenses	8,100.00	11,400.00
Resale, Shop, etc., Licenses	1,305.00	1,350.00
Transfer Fees	27.00	43.00
Sand	1,412.23	1,964.04
Shells (Under Act 227)	105,936.84	105,108.73
Gravel	....	....
Total Receipts	$159,283.32	$166,947.14

REPORT ON PRODUCTION
(Calendar Year)

Total barrels of oysters taken from Louisiana waters:

	1948	1949
Terrebonne	206,309.30	199,806.93
Lafourche	44,287.00	56,778.50
Plaquemines	210,317.50	272,730.75
Jefferson	20,421.00	24,674.00
St. Bernard	215,066.91	272,750.07
Total Barrels	696,401.71	826,740.25

Total cubic yards of sand, shells and gravel taken from Louisiana waters:

	1948	1949
Sand	142,133.40	135,113.69
Oyster Shells	1,069,429.31	1,074,954.19
Clam Shells	1,082,620.82	974,820.61
Gravel	....	....

BIOLOGICAL RESEARCH REPORT

Submitted by

DR. H. MALCOLM OWEN, *Special Biologist*

Objectives

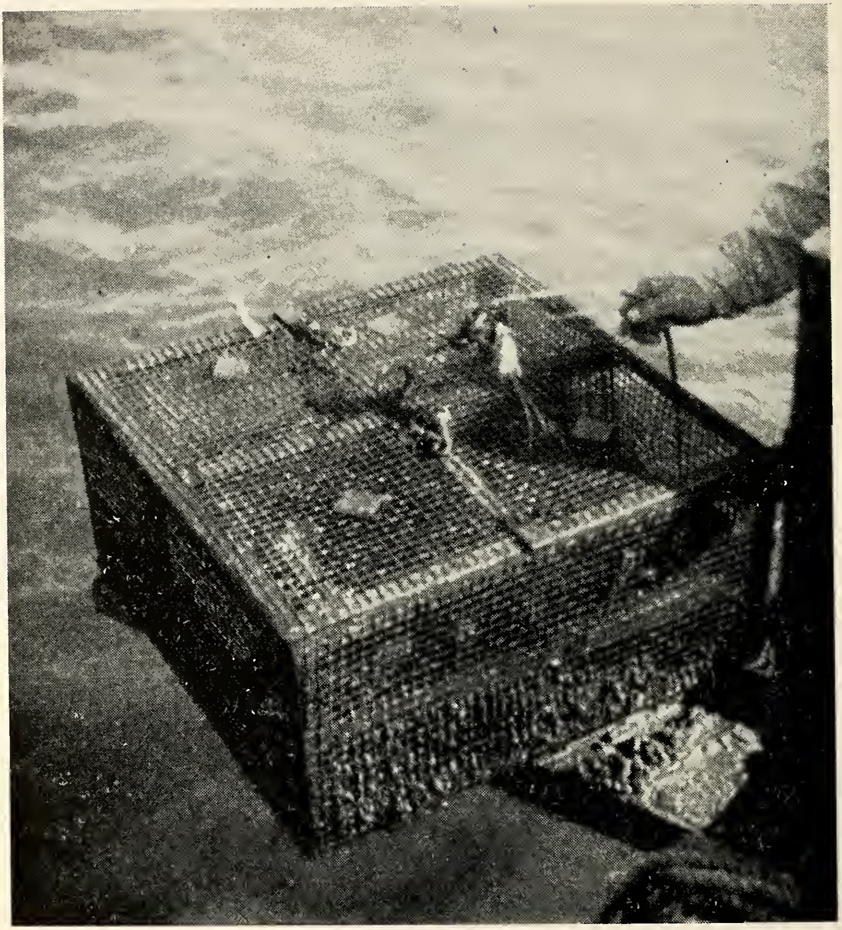
1. To ascertain the cause or causes of the unusual oyster mortalities of Louisiana.
2. To determine the threshold concentrations of oil bleedwater, water soluble fractions of crude oil, and sulfur bleedwater that are detrimental to oysters.
3. To suggest procedures for remedial or policy actions for constituted authorities based on the scientific findings of the above.

Introduction

Since July 1, 1947, the Division of Oysters and Water Bottoms has sponsored an investigation relative to finding the solutions to the problems stated in the above objectives. The first progress report was made in December, 1947, (Second Biennial Report, Louisiana Wild Life and Fisheries).

This second report covers the period from January 1, 1948, to December 31, 1949. Its primary purpose is to report as briefly as possible the nature of the work that has been done and the procedures that are now being followed. The results that have been obtained during the past two years are purposely not incorporated herein. The reason for this being that (1) they are entirely too extensive to be accurately compiled under the short duration of time allotted to prepare this report, (2) they are entirely too extensive to be accurately reported in the space allocated to this report, and (3) it is considered inadvisable to report scientific results before they are thoroughly checked.

This report will, therefore, deal with the generalities of the research. A separate and comprehensive report will be submitted at the completion of the investigation.



Oyster cages used in experimental field work in the oystergrowing areas of Louisiana coastal waters.

A.—Mortality Studies

Biological sites or stations have been established at twenty-five separate locations between Grand Pass and Sister Lake. The stations have been sampled periodically by a standard procedure for the past two years. Three separate field experiments have been concluded in selected areas. In general, the results of these studies have established the fact that unusual mortalities occur which have a positive correlation to high temperatures and high salinities.

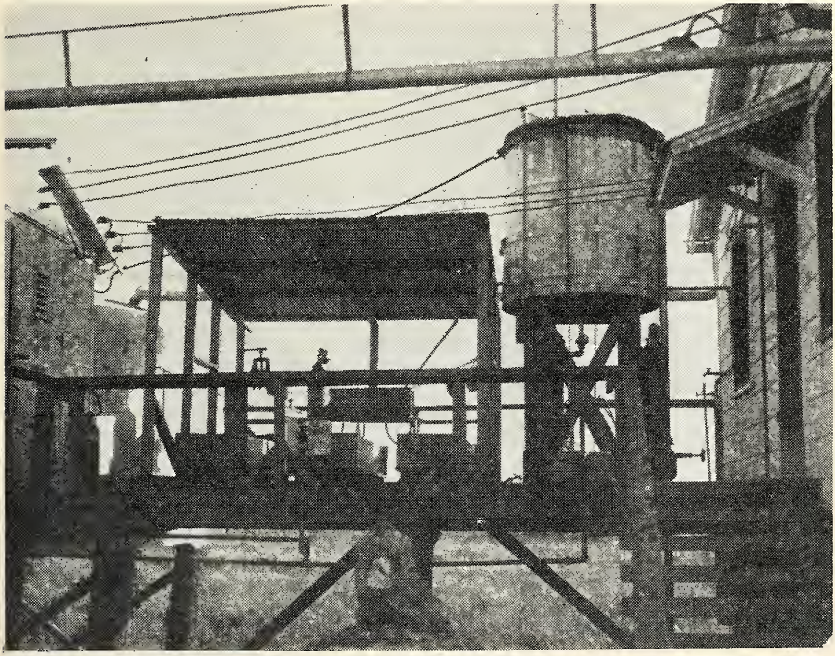
B.—Ecological Studies

The three basic and general ecological areas with respect to oysters are (1) "Louisiana Marsh" or that region east of the Mississippi River, (2) the drainage area between the river and Bayou LaFourche, and (3) the region east of Atchafalaya Bay.

The second of these regions has been very carefully studied with respect to the changes that have taken place during the past sixty years. The most significant result has been that there has been an increase of approximately eighteen per cent more water area in proportion to land area during the past sixty years.

Hydrographical and Climatological data has been accumulated and is in the process of compilation in its relation to other phases of the investigation.

Considerable population distribution studies have been made on the following organisms associated with oysters: mud worm, conch, Boring Sponge and clam, mussel, barnacle, crab, and others.



Outside oyster experimental tanks and salt water system, Sister Lake Laboratory, Terrebonne Parish.

C.—Toxicological Studies

Using oysters and barnacles as index organisms, threshold concentrations have been established for oil bleedwater, sulfur bleedwater, and water soluble fractions of crude oil. These concentrations have been determined by two methods: (1) death of the organism, and (2) heart rate of the oyster.

For the latter method, an ostreodynamometer was developed which is capable of detecting movements within the shell of an oyster without interfering with an oyster's normal activities. Cardiograms of hundreds of oysters have been taken. The results have been statistically analyzed for the determination of the above-mentioned threshholds.

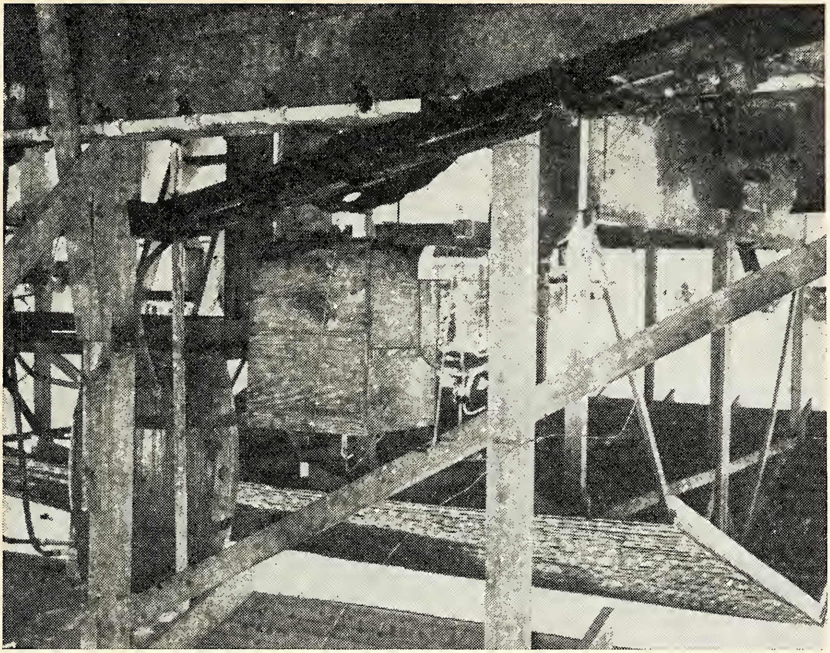
In addition to the above data on the effects of industrial pollutants has been accumulated with respect to their effects on ciliary activity and shell movement of oysters.

The necessary chemical research on this phase of the investigation has been ably handled by Mr. E. J. Breda in the Division's laboratory at Baton Rouge. The research phase to the date of this report has been divided into the following projects: (1) Development of a continuous extraction method for the determination of oil in water. (2) Studies on water soluble fractions extracted from crude oil, and (3) Criteria for the differentiation between major sources of oil.

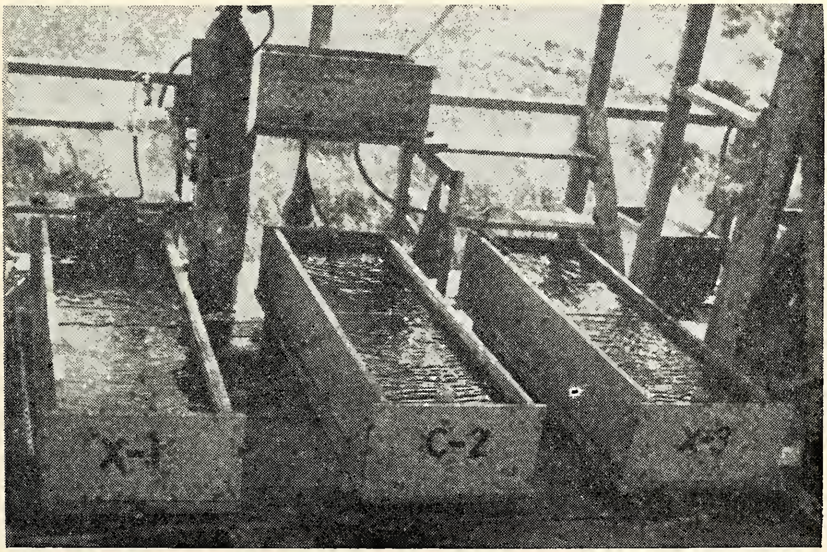
Considerable time and energy of the chemists have been utilized in routine chemical analyses required for the measurements of experiments conducted at the Pensacola laboratory, Sister Lake laboratory and from the field.

D.—Industrial Pollution Studies in the Field

A study has been made of the distribution and dilution of oil field brines from the several points of introduction into the coastal waters. A comprehensive and comparative study has been made on the occurrence of ether soluble materials ("oil") in the muds. Experimental work has been conducted on the effect of methane on oyster survival. Collections and resultant analyses of polluted waters have been made from many areas of the coastal waters.



Low dilution pollutant injection system used in experiments on large numbers of oysters at the Pensacola Laboratory.



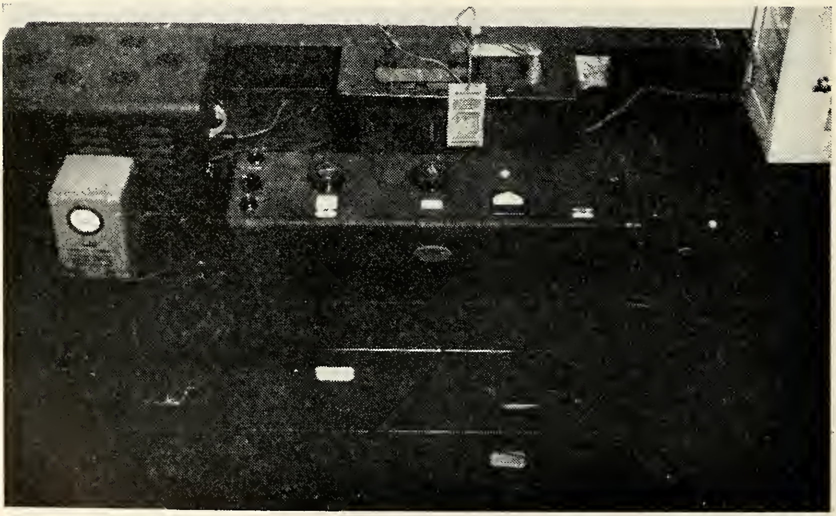
Oyster experiments at the U. S. Fish and Wildlife Service Laboratory, Pensacola, Fla.

E.—Parasitological Studies

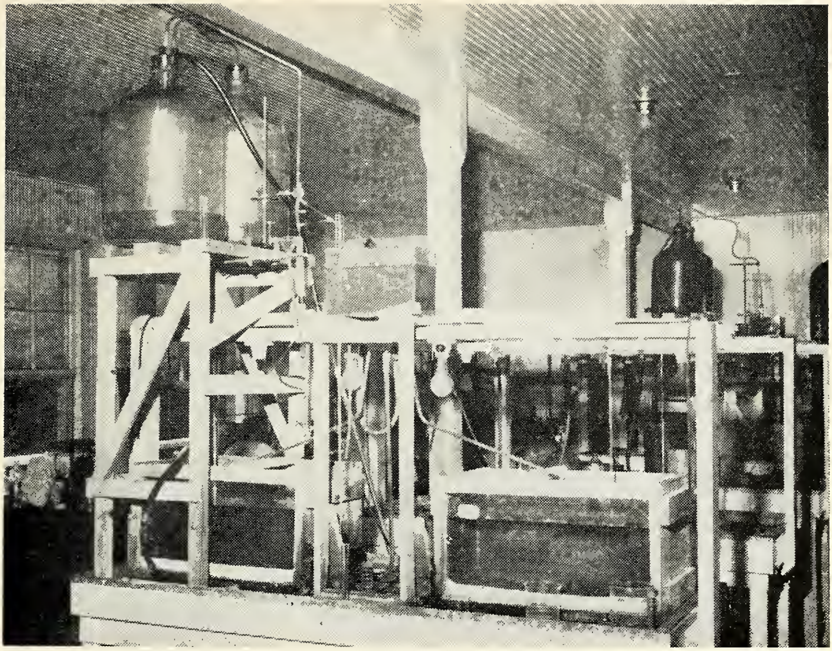
Thousands of oysters from the twenty-five stations have been examined microscopically in order to determine the incidence of parasitic infection.

The protozoan parasite *Nematopsis* which is found in the encysted stage in the tissue of the oyster is a definitive parasite of the mud crab. The results to date have shown a tremendous variation in the incidence of infection of oysters with *Nematopsis* even on the same reef. No positive correlation has been found to mortality.

During the course of the investigation carried out during the past three years in the laboratory at Pensacola, Florida, and in Louisiana coastal waters, a hitherto undescribed parasite of oysters has been discovered. Data thus far acquired appears to associate this organism with many dead or dying oysters under certain environmental conditions, the limits of which are reasonably well-defined. The controlling factors appear to be temperature and salinity, low temperature and low salinity evidently retarding the development of the infestation. Oysters in all conditions of health appear to be susceptible to infestation, but



Beckman Spectrophotometer used in absorption studies and colorimetric determinations of oyster, water, and mud samples.



Oyster experimental tanks, Sister Lake Laboratory, Terrebonne Parish.

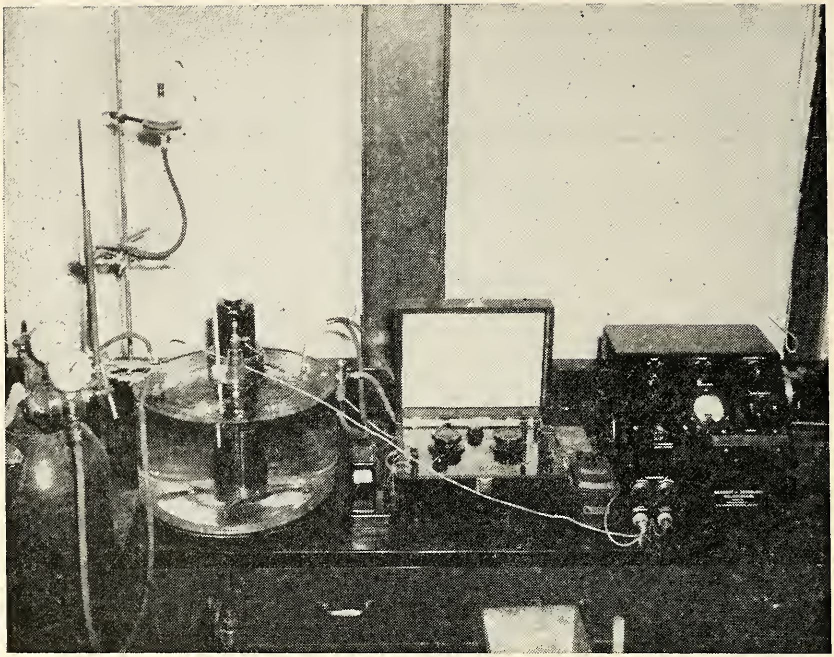
factors resulting in fatigue and miscellaneous adverse environmental conditions appear to accelerate the intensity and spread of the organism. (Contribution #4).

A study has been made on oysters from six selected localities from east coast. Investigations of the taxonomy, physiology, ecology, distribution, and culture of this parasite are still in progress.

Other organisms, e.g. actinomycetes, bacteria, protozoa, flat worms, etc. have been found and their incidence of infection in Louisiana oysters investigated.

F.—Seed Area Investigation

The following seed areas have been continually studied: Mississippi Sound, Black Bay, American Bay, Lake Felicity, California Bay, Quarantine Bay, and Sister Lake. Separate reports on the mortality, quality, incidence of infection (parasitic), and other pertinent data relative to the oyster have been accumulated and are on record for use by the industry.



Sargent-Heyrovsky Polargraph used in determination of metallicious in oyster and water samples.

A particular study has been made of the Sister Lake Seed Reservation. Information has been obtained on the hydrographic, plankton content, metallic ion content, currents, bottom types, oyster larvae population, spat expectancy, and other incidental data which will serve for the intelligent exploitation of this area.

G.—Scientific Service to the Industry

Thirty-one oystermen have requested examination of their oysters or oyster beds. Twenty-seven of these requests resulted in a thorough sampling and study of the local conditions. In some cases, more detailed reports, chemical analysis of muds and oysters have been prepared. In other cases, reports have been submitted at the request of two disputing parties. The impartial and expert findings of such reports, which have been confined to physical damage, have resulted in satisfactory settlements without litigation.

Requests for scientific examination of individual oyster leases where mortality is known to occur are welcomed by the Division.

Summary and Conclusions

The Biological Research Program of the Division of Oysters and Water Bottoms has, during the past two years, accomplished approximately ninety per cent of its planned objectives. In a large measure the success of the "fact-finding phase" has been due to the persistent efforts of the members of the staff. The encouragement and complete backing by the officials of the Division and of the Department has expedited the program.

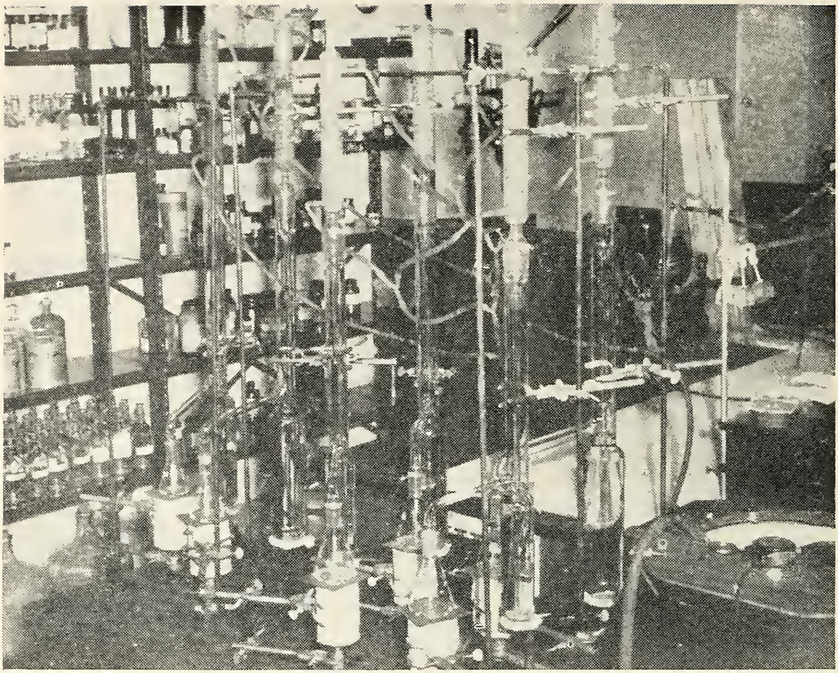
The future research plans call for (1) complete assembling and reporting of the existing data, (2) continued collection of hydrographic data, (3) continued study of the parasites, predators, and competitors of Louisiana oysters, (4) continued study on the ecological conditions and population potentialities of the State-owned seed beds, (5) continued and expanded sicentific service to the individual oystermen, especially pertaining to new and improved methods of oyster culture.

Marine resources are not unlimited. The oyster industry is rapidly approaching a precarious condition. The shrinking industry demands knowledge of the constant changes in the ecology of the region, knowledge of changes in industrial practices, knowledge of the control of parasites and predators, and knowledge of selective breeding are essentials for progressive, modern agriculture.

It is the purpose of the Division, through its biological research program, to continue research which results in the acquisition of knowledge essential for the prevention of critical biological and economic depletion.

Scientific Publications from the Department of Wild Life and Fisheries, Division of Oysters and Water Bottoms. 1948-1949.

1. Owen, H. Malcolm, C. E. Maduell, and R. M. Ingle—1949. An Ostreodynamometer for Determining the Movements Inside the Shells of Bivalve Mollusks. *Science 109* : 148-149.

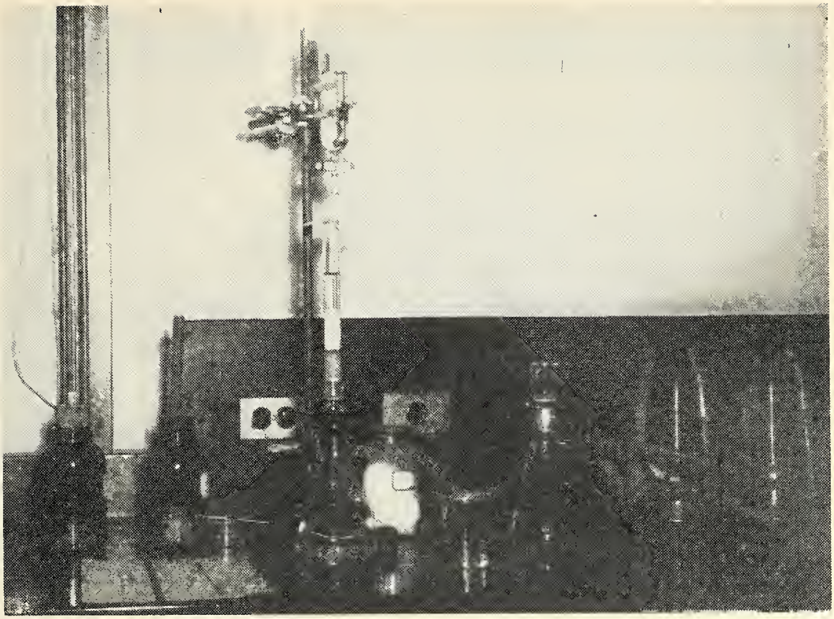


Battery of Continuous Oil-Water Extractors in operation at the Division's chemical laboratory, Baton Rouge.

2. Maduell, C. E., and H. Malcolm Owen—1949. Carrier-type D. C. Amplifier for Biological Research. *Electronics, 22* : 128.
3. Ingle, R. M.—1949. Glycogen and Index of Condition in Oysters. *Science 109* : 593.
4. J. G. Mackin, H. Malcolm Owen, and Albert Collier —1949. Preliminary Note on the Occurrence of a New Protistian parasite, *Dermocystidium marinum* n.sp. in *Crassostrea virginica* (Gmelin). *Science.* 111:328-329.
5. Occurrence of the gregarine parasite, *Nematopsis ostnearum* in *Crassostrea virginica* (Gmelin) in Louisiana waters. (In Press).

Future Plans

Of primary important to the oyster industry of Plaquemines, Jefferson and Lafourche Parishes is to obtain a suitable



Chromatographing unit utilized in the separation and isolation of individual water soluble fractions of crude oil.

control supply of fresh water from the Mississippi River for that area lying west from Bayou Lafourche to latitude 29° 30′ on the north, the Mississippi River on the east and the Gulf of Mexico on the south. River water for this purpose could most easily be obtained from the Mississippi where the Wilkinson Canal meets the highway and again through Bayou Lafourche where the Bayou meets the River at Donaldsonville. Every effort will be made to accomplish this during the coming biennium.

This Division expects to build a camp and place and watchman at the State Seed Oyster Reservation at West Bay Junop as when properly patrolled this area will constitute one of the finest locations for oyster propagation.

The Port of Entry at Grand Pass which was destroyed by the 1947 hurricane and for which the insurance money has been collected will be rebuilt at Bayou Pierre, a short distance east of its former location.

REPORT ON SPILLWAY OPENING AND ITS EFFECT

H. MALCOLM OWEN AND LESTER L. WATERS

Report of the Investigation to Determine the Effect of the 1950 Opening of the Bonnet Carre Spillway on Mississippi Sound.

ON February 10, 1950, on orders from the U. S. Army Engineers, the Bonnet Carre Spillway was opened to divert into Lake Ponchartrain water from the Mississippi River which had reacher critical flood state. Immediately, Ernest S. Clements, Commissioner of Wild Life and Fisheries instructed the Director of the Division of Oysters and Water Bottoms to proceed with the previously determined plans to collect carefully data that would be necessary to evaluate accurately the effect of the influx of fresh river water on the brackish estuaries of Lake Ponchartrain and Mississippi Sound.

The 1937 opening of the Bonnet Carre Spillway was extremely beneficial to the oyster resources of Mississippi Sound according to the local oystermen. The 1945 opening, according to competent investigators, had caused extensive damage to the fishery resources of Lake Ponchartrain and Mississippi Sound. There are considerable financial claims still outstanding as a result of the opening. There were no planned or systematic investigations made on the 1945 opening. Thus, the sagacity of conducting this investigation was apparent to all interested agencies.

In 1948 and 1949, Federal funds were appropriated for an investigation of the oyster producing areas of Louisiana and Mississippi which were damaged by the flood waters of 1945. That investigation (Butler 1949) established the conditions of Mississippi Sound for the two years preceding the 1950 opening. It showed the influence of the fresh water from Pearl River on the salinities of Mississippi Sound. The Department of Wild Life and Fisheries had collected data on the salinities of the Sound since 1943. This information proved to be extremely valuable for the Federal investigation of 1948, 1949 and for comparative purposes for this 1950 study. (See Table I).

TABLE 1

AVERAGE MONTHLY SALINITY, MISSISSIPPI SOUND
STATION "A"

(Grand Pass)

Date	1943	1944	1945	1946	1947
Jan.	12.2	12.2	16.4	14.1	6.8
Feb.	15.6	12.0	7.6	11.9	9.5
Mar.	17.8	11.8	9.4	5.3	5.0
April	5.9	3.6	2.1	8.6	
May	11.1	4.6	0.0	11.8	
June	13.8	9.1	6.3	4.9	
July	14.3	15.5	11.8	10.7	
Aug.	19.1	16.5	11.6	12.5	
Sept.	21.8	19.3	13.7	18.7	
Oct.	20.9	20.8	14.4	18.8	
Nov.	21.0	20.0	14.1	18.2	
Dec.	18.9	13.4	16.0	15.5	20.8
	15.0	13.2	10.3	12.6	

SALINITY RECORD
STATION "B"

(Creole Gap)

Date	1943	1944	1945	1946	1947
Jan.	15.1	12.1	15.8	13.7	6.8
Feb.	15.5	11.7	6.5	12.0	9.3
Mar.	17.4	11.7	8.9	5.6	4.4
April	6.3	3.3	1.6	8.4	
May	10.8	4.7	0.0	12.1	
June	13.9	9.6	6.2	5.1	
July	14.3	14.2	12.0	11.1	
Aug.	14.0	15.7	11.6	12.6	
Sept.	22.1	19.1	13.3	18.8	
Oct.	21.1	22.6	14.9	19.0	
Nov.	22.1	20.2	15.0	18.3	
Dec.	18.4	13.5	14.4	15.3	22.0*
	15.9	13.2	10.0	12.7	

* Creole Gap

SALINITY RECORD
STATION "D"

(Johnson Bayou)

Date	1943	1944	1945	1946	1947
Jan.	11.2	10.2	9.4	8.4	6.2
Feb.	12.1	8.9	5.5	5.8	4.7
Mar.	13.3	10.6	8.0	3.4	4.3
April	5.2	4.2	3.4	4.6	
May	9.8	4.9	0.0	7.5	
June	11.5	5.1	0.0	3.5	
July	7.1	5.7	4.7	1.5	
Aug.	13.3	13.1	5.5	5.6	
Sept.	18.7	14.3	8.7	9.7	
Oct.	17.8	16.3	7.8	12.6	
Nov.	13.8	16.1	10.6	15.3	
Dec.	18.4	11.9	10.4	13.8	18.8

SALINITY RECORD

STATION "E"

(Karaho Bay)

Date	1943	1944	1945	1946	1947
Jan.	11.5	11.5	10.6	8.6	3.2
Feb.	10.8	9.4	6.2	6.2	4.8
Mar.	12.9	10.1	8.9	2.9	
April	5.0	3.6	2.8	7.0	
May	10.4	5.9	0.0	10.5	
June	11.8	6.8	0.0	4.2	
July	8.5	8.2	7.7	3.6	
Aug.	15.4	15.4	6.8	6.9	
Sept.	21.3	16.1	12.9	14.1	
Oct.	19.4	18.2	10.8	15.2	
Nov.	14.8	16.4	11.8	16.2	
Dec.	17.8	14.8	13.0	13.2	16.5

SALINITY RECORD

STATION "F"

(Half Moon)

Date	1943	1944	1945	1946	1947
Jan.	6.2	6.4	7.4	4.4	1.4
Feb.	7.6	3.0	.9	1.8	1.6
Mar.	6.9	3.9	1.1	.3	1.3
April	.4	.06	0.0	2.6	
May	4.3	.8	0.0	3.8	
June	6.3	3.4	0.0	0.0	
July	6.4	8.4	3.3	2.9	
Aug.	12.8	10.9	3.0	6.4	
Sept.	16.8	10.4	6.7	9.8	
Oct.	11.3	10.9	6.9	10.1	
Nov.	13.0	11.4	9.2	8.6	
Dec.	10.6	12.2	8.4	6.1	9.3 *

* Grassy Is.

Engle, Hurricane Rep.

SALINITY RECORD

Station "G"

(3 Mile Bayou)

Date	1943	1944	1945	1946	1947
Jan.	7.6	8.4	7.7	6.2	4.6
Feb.	8.4	7.4	2.8	4.0	3.2
Mar.	8.8	6.1	3.5	3.1	3.0
April	1.9	1.6	.9	4.2	
May	7.7	2.4	0.0	4.7	
June	7.4	3.2	0.0	.3	
July	6.0	7.0	4.1	9.1	
Aug.	12.1	9.9	2.1	4.5	
Sept.	18.1	13.2	8.5	8.4	
Oct.	16.7	14.1	6.7	11.0	
Nov.	13.0	13.2	10.3	15.2	
Dec.	13.4	8.3	11.3	10.9	9.6

This 1950 investigation was planned to establish the hydrographic conditions of Mississippi Sound prior, during, and after the influx of Mississippi River water. Also, it was planned to determine the effect of this water on the survival of oysters from natural reefs in the Louisiana oyster growing area of the Sound.

Grateful acknowledgement is made for the cooperation of the U. S. Army, Corp of Engineers, who supplied the data of the daily water discharge through the Spillway. The cooperation of the following individuals is also acknowledged: Mr. Nat Pedro, who collected water samples and observed the rate of water flow through Lake Ponchartrain; Miss Margot Gack and Miss Anne Liversedge, who collected and analyzed water samples from Transect III in Mississippi Sound; and Captain Charles Peterson, who periodically maintained Transect I. Mr. William Shell, Corps of Engineers, accompanied and assisted the authors with the many details of sampling. Mr. James Engle, U. S. Fish and Wildlife Service, assisted the authors from February 11 through February 23, 1950.

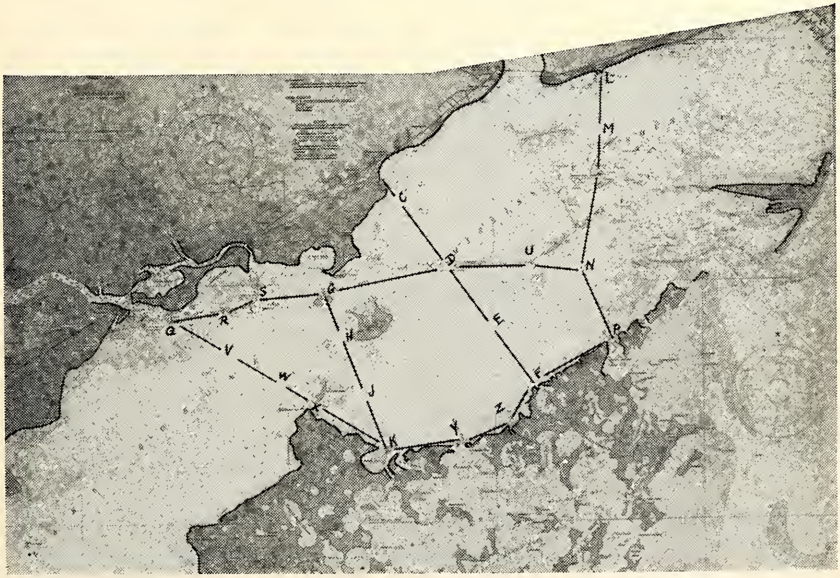


FIGURE I—Map of West Mississippi Sound, showing location of stations.

II. Procedures

Twenty-one salinity and sediment stations were established in Mississippi Sound and one in Lake Ponchartrain (Figure 1). Bottom samples of water were taken at regular intervals from each station. These samples were analyzed by titration for the salt content of the water. Certain samples were selected for regular photospectrometric sediment analysis. The temperature of the water was taken at regular intervals.

TABLE II

DISCHARGE OF THE BONNET CARRE SPILLWAY
1950

Date	Mean Time	Discharge 1,000 C.F.S.	Mean Gage Lower Dyke
2-11	1300	57	23.1
2-12	1300	78	22.8
2-13	1300	95	22.8
2-14	1200	102	22.7
2-15	1300	115	22.6
2-16	1300	114	22.5
2-17	1200	118	22.5
2-18	1200	125	22.4
2-19	1200	136	22.5
2-20	1200	141	22.6
2-21	1200	146	22.6
2-22	1200	154	22.6
2-23	1200	159	22.7
2-24	1200	166	22.7
2-25	1200	172	22.8
2-26	1200	178	22.8
2-27	1200	181	22.9
2-28	1200	185	23.0
3-1	1200	194	23.0
3-2	1200	197	22.9
3-3	1200	207	22.9
3-4	1200	223	22.9
3-5	1200	215	22.9
3-6	1200	215	22.8
3-7	1200	211	22.7
3-8	1200	207	22.6
3-9	1200	199	22.3
3-10	1100	195	22.2
3-11	1100	186	22.1
3-12	1100	180	22.0
3-13	1200	161	21.8
3-14	1200	146	21.7
3-15	1200	128	21.8
3-16	1200	106	22.0
3-17	1200	72	21.8
4-11	1200	..	14.1

Data supplied by U. S. Army, Corp of Engineers.

Two oyster reefs were selected at stations H and E respectively as index stations. These oyster reefs were sampled by a standard procedure to determine the existing mortality and the mortality after exposure to fresh water.

Frequent aerial observations were made on the course of the river water through Lake Ponchartrain (Figure 2). Observations were also made on the fresh water currents in Mississippi Sound.

111. Results

A.—Spillway Discharge—The Spillway opening of the 1937 and 1950 were strikingly similar. In 1937 the needles were pulled on February fourth; in 1950, on February tenth. The Spillway was closed on March 16, 1937 after a period of forty days; and a day later in 1950, having remained opened for a total of thirty-five days. It was open for fifty-five days during April and May, 1945. The total amount of river water that passed through in 1937, 1945, and 1950 was 12,000,000 a. f., 24,000,000 a. f., and 11,000,000 a. f., for a daily average of 155,675 c. f. s., 224,418 c. f. s., and 156,114 c. f. s., respectively (Table 2 and Figure 3).

Eighteen days were required for the river water to flow completely through Lake Ponchartrain. The diffusion head started through Chef Menteur and the Rigolets on March first. On March second the main head had reached Lake Borgne (Figure 2).

The passage of the Spillway water in Lake Borgne and Mississippi Sound could not be followed by observation. The red-brown coloration had conspicuously decreased as this water mixed with the fresh water from Pearl River.

B.—Salinities in Lake Ponchartrain—Station A was established at the New Orleans Airport on the south shore of Lake Ponchartrain. The depth of the water at this station was three feet, and the bottom hard sand.

On February eleventh the salinity was two parts per thousand. The water remained slightly brackish until February twenty-eighth. After this and up until the present time the water in the Lake was completely fresh (Table 3).

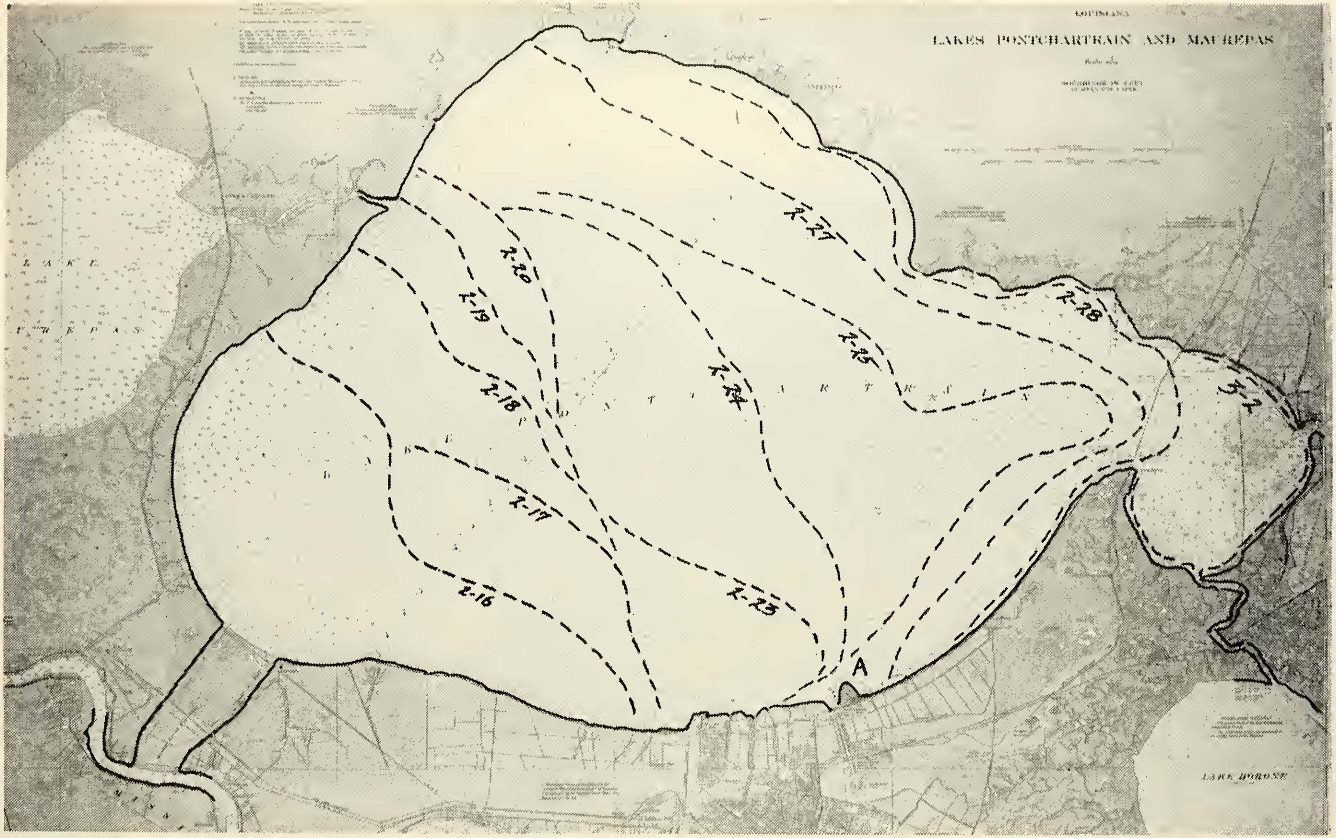
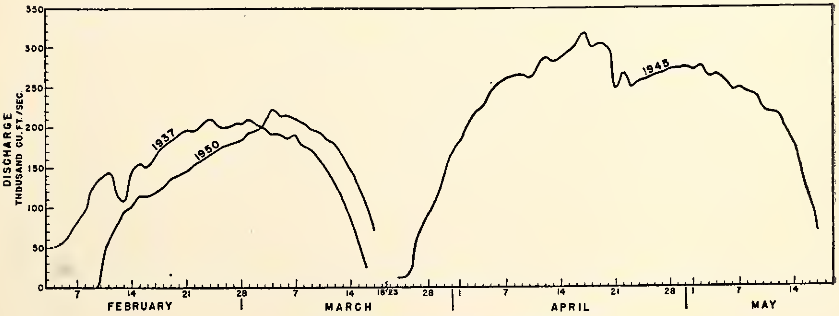


FIGURE II—Map of Lake Pontchartrain, showing rate of movement of Mississippi river water from the Bonnet Carre Spillway to Southeast Pass, Chef Menteur and the Rigolets.

TABLE III

Date 1950	Time	Salinities %
2-11	1320	2.0
12	1410	2.0
15	0905	1.5
16	1700	1.5
17	0825	1.5
18	1035	1.5
19	1650	1.5
20	1325	1.5
21	1545	1.5
24	1525	1.5
25	1045	0.5
27	1415	0.5
28	1440	0.2
3- 2	1425	0.2
4	0955	0.1
5	1530	0.1
6	1310	0.1
8	1605	0.1
10	1650	0.1
14	1645	0.1
16	1520	0.1
18	1220	0.1
20	1255	0.1
22	1325	0.1
24	1525	0.1
26	1220	0.1
29	1715	0.1
30	1600	0.1
4- 1	1210	0.1
3	1300	0.1
6	....	0.1
10	1300	0.1

Salinities of Lake Pontchartrain Station A after 1950 opening of the Bonnet Carre Spillway. Bottom Samplers; depth of water—3 feet.



GRAPHS INDICATING DISCHARGE OF WATER
THROUGH BONNET CARRE SPILLWAY FOR YEARS
1937, 45 & 50

DEPT. OF WILDLIFE & FISHERIES
DIVISION OF OYSTER & WATER BOTTOMS
DATA FROM U.S. ENGRS.-NEW ORLEANS DIST.

FIGURE III

C.—Salinities of Mississippi Sound—The series of twenty-one stations was established in two longitudinal and three transverse lines in West Mississippi Sound (Figure 1). Collections were made at the various stations at intervals in which the influence of the tidal cycle and prevailing winds would be shown in the results.

The record of the daily salinities is on file with the Division of Oysters and Water Bottoms. Figures 4, 5, and 6 represent graphically the conditions of West Mississippi Sound prior to

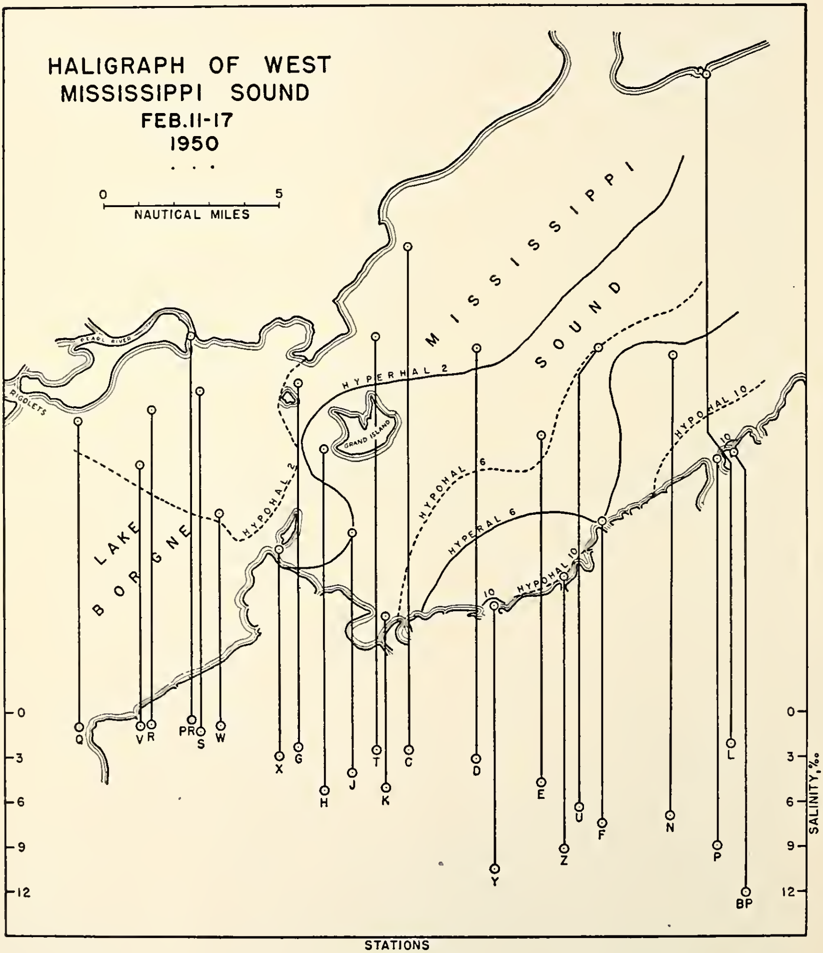


FIGURE IV

and during the influx of Mississippi River water. Lake Pontchartrain is now serving as a reservoir for fresh water and it is estimated that it will require many months for complete recovery to the brackish environment. Thus, Figure 5 does not represent "normal" hydrographic conditions. However, it clearly indicates the return to more optimum saline environment conditions with respect to oysters.

The salinities of West Mississippi Sound are represented graphically by the method devised by Stauber 1943. The haligraph (Figure 4) for the week of February 11th, for example, shows that the water of the Sound was approximately longi-

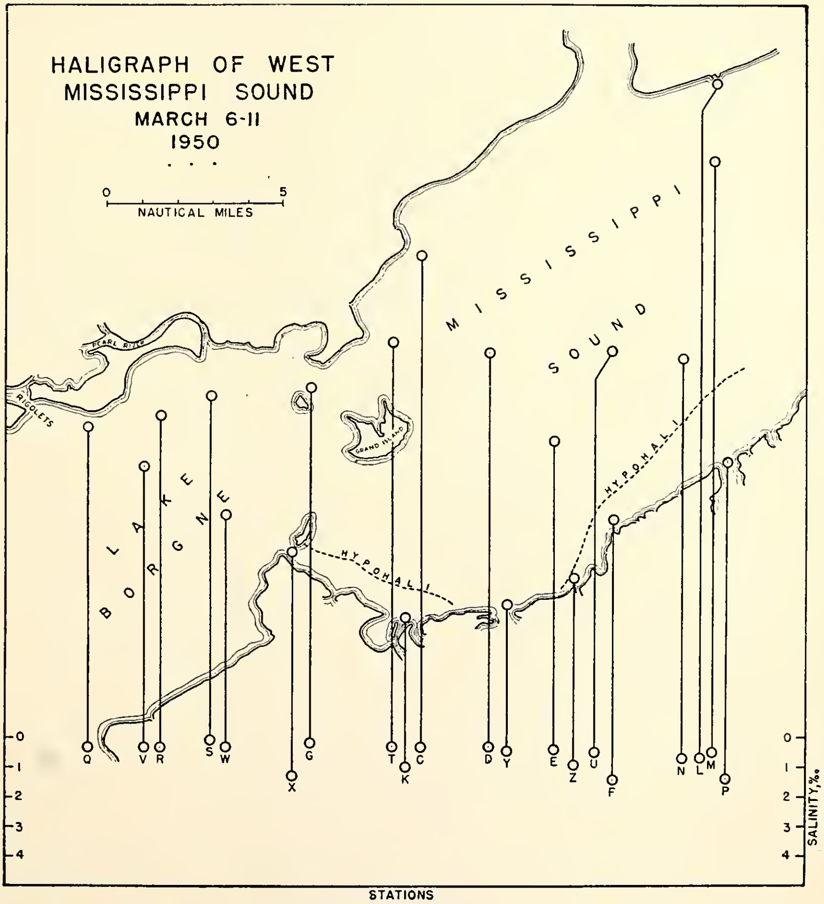


FIGURE V

TABLE 4

Date	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z
2/11 to 2/17	2.5	3.1	4.7	7.4	2.3	5.2	4.0	5.0	2.1	..	7.4	15.1	1.0	0.8	1.3	2.5	6.3	0.9	0.9	2.9	10.4	9.1
2/20 to 2/25	0.8	0.9	1.8	3.1	1.4	1.6	2.0	3.0	1.7	1.0	5.7	3.2	..	..	..	..	..	..	..	..	3.4	3.3
3/26 to 3/ 4	0.7	0.9	1.3	3.1	..	..	..	..	1.3	1.0	2.0	2.8	..	..	..	..	..	..	..	..	..	..
3/ 6 to 3/11	0.3	0.3	0.4	1.4	0.2	..	..	1.0	0.7	0.5	0.7	1.4	0.3	0.3	0.1	0.3	0.5	0.3	0.3	1.3	0.4	0.9
3/13 to 3/18	0.3	0.2	0.3	0.7	..	..	..	..	0.7	0.1	0.2	0.6	..	..	..	..	0.2	..	..	..	..	..
3/19 to 3/23	0.3	0.2	0.2	0.7	..	..	..	..	0.6	0.1	2.3	0.8	..	..	..	..	2.3	..	..	..	..	..
3/24 to 3/30	0.5	0.2	0.5	0.9	..	..	..	..	0.9	2.5	5.0	2.2	..	..	..	..	..	..	..	..	..	..
4/ 1 to 4/ 7	1.1	0.3	2.4	9.9	0.3	0.5	0.5	0.8	1.0	2.5	10.6	10.9	0.2	0.3	0.2	0.2	..	0.2	0.4	0.4	5.5	7.8

Weekly average of Salinities of West Mississippi Sound. Salinity expressed as parts per thousand.

tudinally stratified with respect to its salt content. The area bounded by hypohal 2 was fresh. There was only a slight difference in the water shown enclosed by hyperhal 2. The saline conditions of the remaining area of the Sound were optimum for oyster survival. Pearl River was in flood stage at this time, and this influence on salinities as a potential factor of oyster mortality was found to be confined to the relatively small area adjacent to the mouth and on the north shore of Mississippi Sound. The salinity records of past years confirm these findings.

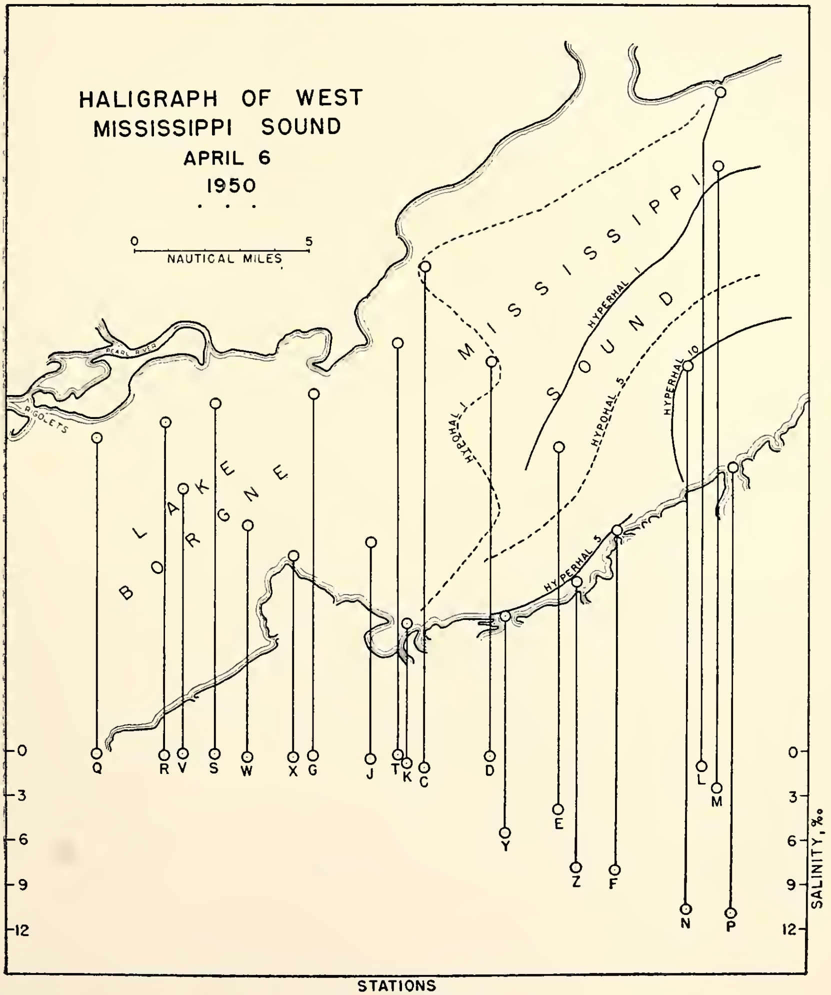


FIGURE VI

The south shore of Mississippi Sound from the year 1942 (February and March) averaged above the critical minimum salinity of 5.0 ‰ during flood periods of Pearl River. In fact, this source of fresh water undoubtedly accounts for the steady maintenance of the successful oyster population of the "Louisiana Marsh" and Mississippi Sound east of Half Moon Island (Table 4).

Figure 5, haligraph of West Mississippi Sound for the week of March sixth, illustrates the combined effects of Pearl River and the fresh water from Lake Pontchartrain. The influx of river water into Pontchartrain pushed the normally low saline water of the Lake into the Sound. The mixing of this with fresh water from Pearl River plus the influx of Mississippi River water produced low salinities throughout the Sound for a period of twenty-nine days. The condition shown in the haligraph of March sixth to eleven depicts the condition of the Sound at the peak of the low salinity period.

The return to saline normality was evident on March twenty-second, five days after the closing of the Spillway. The bulk of Mississippi River water had not reached Mississippi Sound at this time. The recovery from the fresh water environment had gradually progressed and is still gradually progressing, as is illustrated by Figure 6.

The direction and velocity of wind and the tidal current are major contributing factors for determining the salinities, especially the persistence of salinities under conditions such as were found from February 11 to April 6, 1950. A brisk northwest wind accelerated the movement of fresh water through the passes of Pontchartrain into Lake Borgne, and also accelerated the movement of fresh water through the passes and bayous on the southern shore of the Sound. Conversely, the south winds brought in the saltier waters from the outside. The tidal cycle produced a wedge-like shift of the two types of waters during a twenty-four hour period. Storm conditions of March 27 and April 3 and 4 greatly facilitated the mixing of the fresh and salt waters (Table 5).

D.—Sedimentation in Lake Pontchartrain—One of the potential dangers to a brackish estuary is rapid and heavy deposition of silt to a relatively stable bottom. The biotics of Lake

TABLE V

TABLE OF WIND DIRECTIONS IN MISSISSIPPI SOUND

2-11-50 to 4-11-50

Date	Wind Direction
2-11	E
12	S
15	NW
16	NW
18	SSE
20	SSW
22	W
23	N
24	SSW
25	SSE
26	ESE
28	S
3- 2	ESE
4	NNE
6	NNW
8	N
9	NE
11	SE
13	NW
15	ESE
17	SE
19	ESE
20	SE
21	S
22	NW
24	ESE
27	SW-storm
30	NNW
4- 2	S
4	N-storm
6	NNE
9	....
11	SE

Pontchartrain has been changed after each opening of the Spillway (Gowanloch, unpublished data). The residents of this area after interviews concurred that the greatest damage caused by the Spillway was the "smothering of the bottom grass."

By aerial observation, the water of the Lake was green prior to the 1950 opening. As the river water replaced the salt water the color changed to reddish brown. Measurements of turbidity, made with the Fisher photospectrometer, show the percent of light transmission, the higher percentages representing the less turbid water (Table 6).

A comparison of Table 6 with Figure 2 shows that the gradual passage of river water carried a diffusion head of sus-

TABLE VI

Station E

Date	Percent light transmission
2-11-50	83.4
2-15-50	36.9
2-17-50	49.1
2-20-50	69.1
2-22-50	56.3
2-23-50	15.8
2-25-50	85.8
2-28-50	64.6
3- 2-50	37.3
Pearl River	
2-12-50	73.7
Station A	
Lake Pontchartrain	
2-11-50	92.2
2-12-50	98.1
2-20-50	88.8
2-22-50	60.3
2-24-50	84.7
2-25-50	55.7
2-28-50	46.4
3- 2-50	47.4
3- 4-50	24.7
3- 5-50	44.7
3- 6-50	55.8

Showing the results of measurements for turbidity at selected stations.

pended silt. A significant increase in turbidity occurred on February 28 when the main silt head reached Station A. The turbidity results of the fifth and sixth of March and subsequent observations of the collected samples indicate that the majority of the silt load was deposited in Lake Pontchartrain. However, as has been mentioned, the wind velocity is of primary importance in shallow and soft-mud bottom lakes.

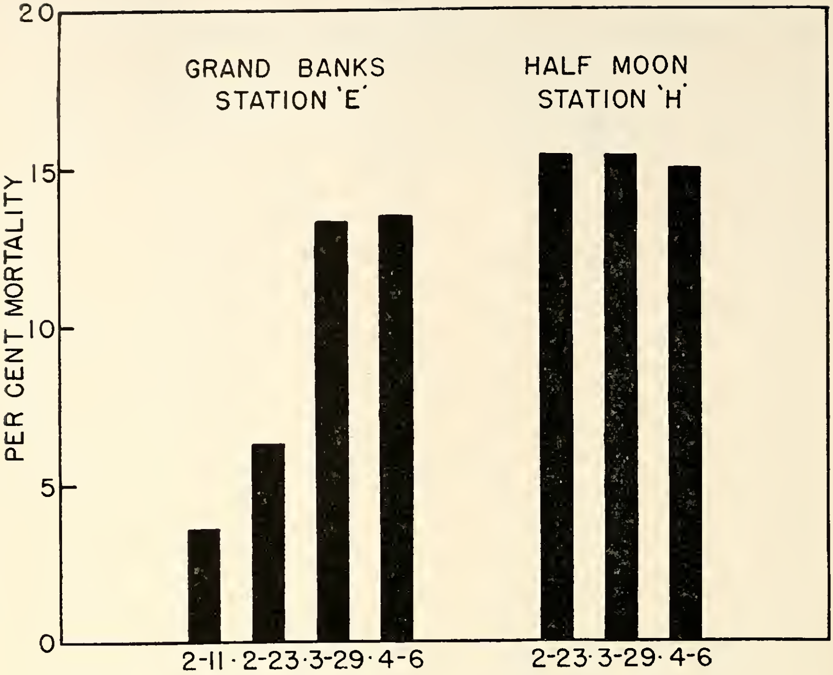
E.—Sedimentation in Mississippi Sound—During the period of this investigation, the waters of Mississippi Sound were turbid. The degree of turbidity was dependent upon the wind.

To date, there is no correlation with the turbidity of the waters of Mississippi Sound and Pearl or Mississippi Rivers waters. One half mile up the mouth of Pearl River the water was clearer than it was at eight of thirteen stations in Mississippi Sound on February twelfth (Table 7). There was no evi-

TABLE VII

TURBIDITY OF WATER IN MISSISSIPPI SOUND
FEBRUARY 11 TO MARCH 6, 1950

Date	Station No.	% Light Transmission
2-11-50	T	74.0
	G	53.4
	S	65.0
	R	41.9
	Q	66.1
	V	63.7
	W	72.7
	X	79.7
	K	53.4
	Y	69.9
	Z	90.5
	F	93.7
	E	83.4
	D	45.8
	C	46.4
	D	58.5
	U	63.1
2-12-50	N	84.4
	BP	83.4
	P	47.6
	F	97.5
	Y	97.3
	Y	89.8
	K	57.2
	J	62.5
	H	60.8
	S	49.3
	PR	73.7
	G	54.5
	T	28.5
	C	29.6
2-15-50	C	64.7
	C	83.7
	D	31.4
	D	52.6
	E	36.9
	F	69.8
	P	18.8
	N	49.7
	U	74.3
	T	56.3
	G	44.0
	S	68.1
2-16-50	L	84.9
2-17-50	E	49.1
2-18-50	L	88.8
2-20-50	E	69.1
2-22-50	E	56.3
2-23-50	G	75.3
2-23-50	H	78.7
	E	15.8
2-25-50	M	72.0
	E	85.8
2-28-50	M	67.3
	E	64.6
3- 2-50	E	37.3
3- 6-50	M	65.0



OYSTER MORTALITY-STATIONS E & H
MISSISSIPPI SOUND-BONNET-CARRE SPILLWAY
1950
FIGURE VII

dence of excessive silting in any of the oyster reefs of Mississippi Sound.

E.—Oyster Mortality—Samples of oysters were taken from several stations in West Mississippi Sound at periodic intervals during the investigation (Table 8). These oysters were from reefs that were damaged by the flood waters of 1945. After the premilinary sampling of February 11 to 23, two stations (H and E) were selected as index stations for mortality studies.

Progressive but a low mortality of oysters occurred at Station E. Oysters at Station H have not had appreciable mortality based on the standard procedure for measurement that was used. However, the number of bright shells scars which was

TABLE VIII

PERCENT MORTALITY OF OYSTERS, WEST MISSISSIPPI SOUND

1950

Date	Station	Location	% Mortality
2-11	Y	E. Three Mile Bayou	12.1
2-11	Y	W. Three Mile Bayou	24.6
2-11	E	Grand Banks	3.6
2-11	F	Turkey Bayou	16.0
2-15	F	Turkey Bayou	7.5
2-15	P	Grand Pass	6.1
2-23	H	Half Moon Island	15.4
2-23	E	Grand Banks	6.3
3-29	E	Grand Banks	13.3
3-29	H	Half Moon Island	15.4
4- 6	E	Grand Banks	13.6
4- 6	H	Half Moon Island	14.8

found on oysters at Station H attest to higher mortality figures. The mortality was estimated to be approximately thirty percent.

A check sample was made on April sixth. A slight increase in mortality had occurred at Station E. There was not a significant change at Station H.

IV. Conclusions

It has been established that salinity of brackish water below 5 parts per thousand is critical for oyster life. The factors of temperature, physiological condition of the oysters, and possibly other chemical constituents of the waters serve to modify this generally accepted principle. The temperature of the water in Mississippi Sound was comparatively lower in 1950 during February, March, and April than it has been during the past three years. The maximum and minimum water temperature of this investigation was 20.5°C and 15.1°C respectively. Positively correlated to low temperatures is the quality or condition of the oysters. The condition of oysters was observed to be good and remained so after subjection to fresh water.

The 1945 opening of the Spillway came at a time of higher temperatures and it is logically assumed at a time of poor condition of the oysters.

The return to saltier conditions (Station E) has been gradual and from a knowledge of the existing conditions, it is expected to continue to be gradual. Thus the oysters were not and are not expected to be subjected to sudden or extreme reverse changes in salinity which is equally detrimental.

The influx of fresh water reduced the snail or oyster conch population in Bayou Pierre and reefs west of this station.

It is essential for the maintenance of a successful oyster population that there be a source of nutrient-bearing fresh water. During the past few years Pearl River has had above normal drainage into the Sound. This undoubtedly has created an adverse environment for oysters on the northern shore of the Sound and frequently for those reefs immediately opposite the mouth on the southern shore (Butler 1949). In the opinion of the authors, however, this is far outweighed by the benefits to those reefs in the southern region of the "Louisiana Marsh" and to those of eastern Mississippi Sound.

The constant shifting of wind direction accelerated the mixing of fresh and salt waters with the resultant betterment of the environmental conditions.

There has not been any observable or measurable detrimental siltation of the oyster reefs of Mississippi Sound from Pearl River or from water from Lake Pontchartrain. There was a measurable difference in turbidity of the water in Lake Pontchartrain before and after the Spillway opening. The detrimental effect of this silting on the biotics of Pontchartrain can only be speculated. In the opinion of the authors it will cause considerable change and resulting damage.

From this investigation and from past salinity records of Mississippi Sound, the extent of critical fresh water from Pearl River alone is confined to that area west of Stations C, D, E, and F. The constant flow of fresh water from Lake Pontchartrain is sufficient to more than double this area in an east and south direction. In 1937 and 1950 the flow of water from Lake Pontchartrain was of short duration when compared to that of 1945. In 1950, because of the time of the year and relatively short exposure, the major reefs of Louisiana were not materially damaged but are expected to be benefitted as a result of the opening of Bonnet Carre Spillway.

DIVISION OF RESEARCH AND STATISTICS

FRANK COOGAN, *Director*

Frank Coogan

THE activities of the Division of Research and Statistics have been confined almost exclusively to the investigation of industrial waste pollution, this being the same as in the previous years. The mechanics of the problem of pollution abatement can be broken down into three parts;

first, the investigation of complaints received from personnel of other Wild Life and Fisheries divisions, from various state agencies, and from citizens of the state—second, surveys of stream basins and industrial groups involved—and third, the recommendation when necessary, concerning the complaint submitted to the Stream Control Commission with a request for a certain type of action to be taken by the Commission. For the past several years, it has been the policy of the Department of Wild Life and Fisheries to refer to the Stream Control Commission for action the vast majority of the pollution cases that have been investigated by this division. The reason for this is that the legal machinery set up in the Stream Control Commission Act has been found to be very effective in obtaining pollution abatement, so with the exception of some cases of gravel plant pollution where the steps to be taken to correct the pollution are absolutely clear, the department has referred to the Commission all cases where it is considered that legal steps are necessary.

The personnel of the Division presently consists of a director, a stenographer, one chemist, two laboratory assistants and three waste disposal inspectors. The number of waste disposal inspectors was increased from two to three on December 6, 1948. The addition of this waste disposal inspector has given the division increased coverage in the New Orleans area and additional coverage in the Bayou Lafourche and Bayou Teche areas. The work load in the northern part of the state has increased steadily with the discovery of new oil fields and the depletion of oil fields now in production in this area. The depletion of the fields in the northern part of the state has resulted in increased production of salt water produced with the oil. It has been determined that salt water or oil field brines are toxic in fairly low concentrations to various forms of aquatic life and it appears more and more necessary to exclude the vast majority of these oil field brines from the fresh waters of the state. It is hoped that in the near future one or possibly two more waste disposal inspectors will be hired by the Department for work in the northern part of the state. It is the writer's belief that an inspector should be located in Shreveport and one in Monroe in addition to the waste disposal inspector presently located in Alexandria. This distribution of personnel would allow constant and complete supervision of the fields and would materially cut down on the presence of oil on the waters of such places as Caddo Lake, Little River and other water bodies adjacent to producing areas.

The activities of the Louisiana Petroleum Refiners' Waste Control Council have been actively supported by the several oil refineries here in the state. The research sponsored by this group has proved invaluable to the Department in as far as industrial waste pollution abatement is concerned. The Control Council sponsored biologists working in the Department's laboratory have run a whole series of tests to determine the toxicity of pure chemicals and combinations of pure chemicals on blue gills, gold fish and daphnia, a small crustation and a very important game fish food existing naturally in the waters of the state. When this work is completed, there will be available data which will allow those concerned with such problems to properly determine the toxicity of the various industrial wastes which reach the waters of the state. This will mean that certain dilution ratios can be set up which will allow the disposal of such wastes to take place without the possibility of creating toxic conditions to effect aquatic life in the receiving streams. The spirit of cooperation shown by the refinery group in financially backing this program is to be highly commended.

The research program of the National Council for Stream Improvement of the Pulp Paper and Paperboard Industries, Inc., is proceeding along the lines set up several years ago. The resident engineer of the National Council is conducting experiments leading to the possibility of stabilization of sulphate paper mill waste in storage basins. The results of the engineers' research indicate that there is a possibility of obtaining as much as 70% to 80% reduction of the bio-chemical oxygen demand of the waste by storing under certain conditions and with the addition of certain so called nutrient elements such as phosphorus and nitrogen. Of course it must be realized that this research is a long term program and that no immediate results will probably come from the data collected during the course of the program, but eventually it is hoped that the knowledge obtained in the laboratory can be applied to the storage basins with a consequent reduction of B.O.D. which would allow the disposal of the impounded waste with little or no effect on the receiving waters.

To Control Pollution

The Eightieth Congress of the United States of America passed what is commonly known as the Federal Anti-pollution Act, Public Law 845. This Act is administered by the United States Public Health Service and has the purpose of controlling what might be called interstate pollution, that pollution which originates in one state and affects the waters of an adjacent state. As an example I might cite the pollution of some of the bayous in southern Arkansas by Arkansas Oil Fields. These pollutants flow into Louisiana and cause pollution of the waters here in the state. The law provides for hearings to be held on such problems and further calls for recommendations by engineers of the Public Health Service to the state in which the pollution originates, said recommendations having to do with the means of abating this pollution. Two such hearings have been held in states adjacent to Louisiana, and very good results have come from such hearings. The state of Louisiana has just one pollution problem that may come under Public Law 845, and that is the pollution of Pearl River by an industrial organization in Bogalusa. Pearl River is an interstate boundary between Louisiana and Mississippi. It is hoped that there will be made such investigations as are necessary to determine the state of pollution of this stream before the Public Health Service is officially and formally called in to hold a hearing on the matter.

In conclusion the writer wishes to state that he believes that the Louisiana pollution abatement program is going forward and that effective work has been done in the last two years. That the work is effective is largely due to the cooperation that the various industries involved have given and it is further believed that the next two years will see further gains in pollution abatement.

POLLUTION ABATEMENT BY INDUSTRIES AND AREAS

PULP AND PAPER MILLS

Northwestern Louisiana

The second largest kraft pulp mill in the world is located in the northwestern part of Louisiana, about 15 miles from the Arkansas line and about 30 miles east of the Red River. This mill utilizes enormous quantities of water in the manufacturing processes carried on and discharges about 25,000,000 gallons of waste per day into impounding reservoirs. During the past several years the owners of this mill have carried on an extensive program to lower the polluting power of the waste originating within the mill, mainly by mill changes — such changes including closing of the digestion system and the reuse of water from paper making machines. This program has been quite successful in that the bio-chemical oxygen demand of the stored wastes has been reduced to around 50 p.p.m. at the time and point of discharge. B.O.D. removal has come about in two ways, one being a result of another, by that I mean that it has been found that B.O.D. removal by natural stabilization from aeration while in storage was inhibited by the presence of certain chemicals in the waste. When the strength of the waste was cut by the addition of more efficient machinery inside the mill, it meant that the amounts of these inhibitory chemicals was cut down in the waste which allowed the waste to gain greater stabilization during it's period of storage.

A new factor in the problem of disposal of waste from this mill was introduced when the Corps of Engineers began the construction of the Bodcau Dam. This dam is built to impound water during periods of high flow and to act as a stabilizing influence on the flow of the Red River. The boundaries of the impounded water are right up flush with the bottom end of the lower retention basin constructed by the mill. The effects of this impounded water on the disposal of waste has not been completely determined. It is hoped that the impounded water will act as a stabilizing agent for the mill waste which will result in complete stabilization before the waste is discharged through the open culverts at the dam. How this will work out is not known because no appreciable amount of water has been impounded as of this date.

The 1948-49 discharge of waste from the mill was fairly satisfactory in so far as fish mortality was concerned. There was ample rainfall and the stream flow in Bodcau Bayou allowed the use of certain dilution ratios which drove the fish out of the Bodcau drainage system before the main volume of the waste was allowed to flow from the reservoir. Little fish mortality was observed, although oxygen depletion took place in the stream from a point about ten miles below the point of discharge all the way down to the Red River. The 1949-50 discharge methods were changed initially because of the lack of rainfall during the late summer months of 1949. Extreme care was taken to discharge only as much waste as Bodcau Bayou could handle during periods of medium flow. Although this method of discharge was started in a period of emergency, it has been found to be very satisfactory. There has been no fish mortality, and a minimum of 2½ p.p.m. of dissolved oxygen has been maintained in Bodcau Bayou up to the time of writing, February 2, 1950. It was originally thought that the discharge of waste beyond the 15th of January would result in inhibiting the run of rough fish up Bodcau Bayou, but present evidence tends to show that if the dilution ratios are held down to a point where a minimum of 2½ p.p.m. of dissolved oxygen is maintained in Bodcau Bayou that the rough fish will begin their run. This means that instead of taking 30 to 45 days to discharge, a period of from 3 to 4 months can be taken to empty the reservoirs and the dissolved oxygen content of 2.5 p.p.m. can be maintained. The spring fish run will take place so this means of disposal will not interfere with the activities of commercial fishermen, and all in all it appears that the proper and desirable method of disposal of waste from this mill has been determined. It is believed that using the data obtained by the research engineer of the National Council for Stream Improvement that the B.O.D. of the waste can be further reduced in the impounding reservoirs used by this mill. This again will result in constant betterment of the conditions of Bodcau Bayou during the discharge, and with any great amount of rainfall whatever we can look for a continued improvement in Bodcau Bayou during the discharge days.

Northeast Louisiana

The two mills located in Bastrop, Louisiana, in the northeastern part of the state are the property of the same organization that owns the mill in northwestern Louisiana. The products of the two mills are different from those produced by the mill in the northwestern part of the state in that such things as single service paper, and other specialties are manufactured. The two mills are operated as a single unit, in as much as the waste produced in one mill is piped to the other mill for chemical recovery and the combined waste from the two mills is discharged from the second mill. The discharge from the mill flows into Little Bayou Boeuf down through Bayou Lafourche and eventually flows into the Black River system. In times past the condition of Bayou Lafourche has been bad during the late summer and fall months. The water was very discolored along that zone of the river in which oxygen depletion was complete. After a series of conferences with the officials of the paper mill, the mill executives proposed to the Stream Control Commission that there be built an impounding reservoir to hold the waste produced from these mills for a period of from four to six months out of every year. This would mean that in periods of low flow of Bayou Lafourche, from about June or July until the fall rains commence, no waste would be allowed to go into Bayou Lafourche. The plans were drawn up, consulting engineers were retained, and the dam and retention levees are half completed. In conjunction with the building of the dam the Corps of Engineers initiated a program of straightening and widening Bayou Lafourche to increase drainage capacity. This program is being carried out almost to the Arkansas line, which would mean that more of the time during the year the flow of Bayou Lafourche would be increased, especially during periods of moderate rainfall, which would mean that ample dilution water for the impounded waste would be available. It is hoped that when this system has been completed, and when the Corps of Engineers have finished their portion of the work on Bayou Lafourche that this problem will be solved. It has been one of the really tough problems faced by the Stream Control Commission and the Department of Wild Life & Fisheries, and it is with much pleasure that the two organizations see the solution of this problem becoming more of a reality every day.

Central Louisiana

The mill located in Central Louisiana on Dugdemona Bayou had an excellent record of discharge of industrial waste resulting from the making of kraft paper. Retention basins have been built and all of the so-called "black liquor" originating in this mill is impounded, to be discharged during periods of high flow in Dugdemona Bayou and Little River. From time to time complaints have been received, alleging pollution of Dugdemona Bayou, but it is believed that with one or two exceptions that the dark color of Dugdemona Bayou has been due to swamp water which has drained into the bayou during times of falling stream levels. There has been some insignificant fish mortality in Dugdemona Bayou but no fish mortality in Little River due to the discharge of effluent from this plant. Certain changes have been or are being made in this mill which will result in lowering the total chemical content of the waste, and it is believed that conditions will get steadily better in this area to a point where it will no longer be a problem for either the mill or the pollution abatement agency.

West Central Louisiana

The small mill located in West Central Louisiana in the Calcasieu River basin still discharges waste without the benefit of any impounding. During periods of low stream flow in the

Calcasieu River, chemical tests on the river water indicate that the waste is stabilized in so far as oxygen demand is concerned, but the black color given to the Calcasieu River by this waste during these river conditions indicate that there must be certain biological changes taking place as result of this discharge. A survey will be made of the biological conditions of the Calcasieu River above and below the point of discharge of Mill Creek into the river to determine whether or not the effluent is causing any material change in the biological condition of the receiving stream. If it appears that the discharge is causing a detrimental change in the aquatic environment then the owners of the mill will be required to install impounding basins to take care of the waste during periods of low flow in the Calcasieu. A survey will also be made in the West Bay Game Refuge Area to determine if the condition of that portion of Mill Creek flowing through that refuge is contaminated to the extent that it can no longer be considered a source of drinking water for the wild life in the refuge. If this proves to be a fact then certain steps will be necessary to clear up this condition irrespective of the effects of the waste when it reaches the Calcasieu River.

Southeast Area

The mill located in the southwestern part of the state is a fairly large mill with a capacity several hundreds tons of kraft pulp per day. Extensive work has been done inside the mill to cut down the amount of waste discharged and the pollutive strength of that waste. Whether or not this will be sufficient to stop the pollution of the upper stretches of Pearl River has not yet been determined.

It is planned to make a survey of this area during the late summer and fall of 1950, which will include a complete check on conditions inside the mill and a determination of the quantity and strength of the waste leaving the mill and the effects of that waste on the upper Pearl during the low water stages. The cooperation of the officials of the mill will be necessary in making this survey, but it is hoped that arrangements can be worked out so that it can be made. Less is known about the condition of Pearl River during low stream flow than any other receiving stream of its type in the state. The reason for this is that Pearl River is extremely hard to get to in the area involved, especially from the Louisiana side. It has been found necessary to go into the river from the Mississippi side in order to get anywhere close to the point where the mill effluent is having its effect upon Pearl River. The river is a perfect maze of passages in this area, and great care must be taken lest one loses one's way during inspection trips.

Sugar Mill Pollution

General.—During the 1948-1949 grinding season weather conditions were such as to make it possible to have a fairly good season in as far as stream pollution was concerned. The meetings held the previous year resulted in efforts by the several mills to clean up the ditches that were used for the disposal of waste from the various mills. This cleaning up of ditches was found necessary because of the fact that an increase of B.O.D. added to the waste water by the vegetation killed by hot water. In addition, this vegetation acted as a gathering point for various kinds of algae. This algae, reproducing and dying, added it's load to the waste stream until in several cases the B.O.D. of the waste when it entered the stream was many many times that of the waste when it left the mill.

Another general effort made by the Sugar Industry was to confine the waste discharged into the state waters to that of condenser water coming from the process used to pull a vacuum on the effects and on the vacuum pans. This meant condenser water only was discharged, that all sweet water, wash water, cane washing water, alkali, acids, etc. were all impounded to be drained off in small portions during the spring months of the year when rainfall was general. Overall, the fish mortality, with one or two exceptions, was held to a minimum. In the grinding period of 1949-1950 this was not the case. From the 15th of October, 1949, until the end of December, 1949, rainfall was very very scant throughout the sugar growing areas, and pollution was heavy, continuous, and wide spread. In addition to the streams chronically polluted by sugar mill waste, streams and water bodies that were normally not harmed, were affected during this past grinding season in spite of the efforts of the various mill operators to cut down as much as possible on the amount and strength of the waste discharged.

Several encouraging things were noted during the past grinding season. The management of those mills who took extreme care in cutting down the losses of sugar into the discharge water were rewarded by having no pollution of the waters that were normally polluted from the discharge of their mills. These water bodies included several that were notorious for pollution during the previous grinding seasons and even during the period of extreme low flow that existed last year, fish mortality was avoided in these waters for the first time in years. These factory operators are to be commended for this but the chief reward for their efforts is that fact that they were checked carefully by waste disposal inspectors from this office and were found not to have polluted these bayous and were not cited for pollution by the Stream Control Commission. In other areas it has been evident that sugar mill operators have not complied with the request of the Department to discharge nothing but condenser water. This is quite evident by checking the results of the hundreds of samples that were run in the division's laboratory on sugar mill waste. The percentage of change of B.O.D. content from one mill to another cannot be accounted for in any other way except to say that one mill was discharging nothing but condenser water while other mills were discharging condenser water, floor washings, sweet water and other waste which originate in the mill.

In 1948-1949 the discharge resulted from the sugar mills located on or in the vicinity of Bayou Teche caused fish mortality in several areas in Bayou Teche. The occurrence of rainfall at opportune time resulted in the flushing out of Bayou Teche from time to time and cut the fish mortality to a minimum. During the 1949-1950 grinding season the bayou immediately began to feel the effects of low stream flow and continued heavy discharge from the various mills and soon became a sore spot with inhabitants of the area. The Corps of Engineers were requested to open up the Charenton Gate to allow Grand River to flow through Bayou Teche to the Wax Lake Outlet. This immediately resulted in an improvement of conditions in Bayou Teche from the Charenton Canal all the way down to the mouth. However, no relief was obtained from the increased stream flows for that area above New Iberia down to the Charenton Canal. All the oxygen was depleted from the Bayou in this stretch and fish mortality took place all along this area. Little or no opportunity is seen to clear up fish mortality in Bayou Teche without holding a general hearing on the matter. At that time among other things that must be commented on is the possibility of the cutting down to an absolute minimum the amount of water used by each mill; the introduction of fresh water into the upper Teche from other areas; and, lastly, the addition of all available amounts of fresh water into the Teche from the Bayou Courtbleau control structure. The bad condition of Bayou Teche interferes materially with the operations of commercial fishermen in this area. It must be indeed discouraging to conduct fishing operations in the stream and realize that from year to year all the fish in certain areas of the stream will be killed. This materially cuts the catch of the commercial fishermen operating in the area from New Iberia down to the Charenton Locks.

Bayou Lafourche

The continued pollution of Bayou Lafourche by sugar mill effluents took place during the 1948-1949, 1949-1950 grinding seasons. The main effects of the discharge were felt in the vicinity of Thibodaux, and 10 to 25 miles of the Bayou were completely depleted of oxygen, and fish mortality occurred in the bayou in that area.

One of the main hopes of this division for the remedying of the pollution of Bayou Lafourche has been placed in the hearings that the Corps of Engineers have conducted regarding the addition of fresh water in Bayou Lafourche by means of siphons or other devices in the Donaldsonville area. If any great amount of fresh water could be introduced into Bayou Lafourche, which would cause a constant downward flow of current in Bayou Lafourche it is believed that the pollution of the bayou itself would stop because there would be enough dilution from fresh water to stabilize the small amount of waste that is entering it from the sugar mills.

The Grand Bayou-Bayou L'Onion system was affected during both grinding seasons, the severity was such to cause heavy fish mortality in the system. Legal steps have been taken by the Stream Control Commission to require the mill responsible for this pollution to take such measures as are deemed necessary to remedy the conditions complained of. In another portion of this drainage area, the Lafourche Parish state wide drainage program has resulted in the pollution of water bodies that were normally not touched by waste from one of the sugar mills located on lower Bayou Lafourche. The officials of the mill have been contacted regarding the trouble and several methods of stopping the pollution of these water bodies has been suggested to the mill officials, and it is believed that by the time the next grinding season comes around that the officials will have put the recommendations into effect.

The Mississippi River—Bayou Choctaw Area

In times past the only water bodies seriously affected by sugar mill pollution in this area have been Bayou Choctaw and Grand Bayou in Iberville Parish. In so far as Bayou Choctaw is concerned intensive investigation was made of pollution of this bayou during the past grinding season and it was determined that the pollution was coming from two mills and resulted from certain weather conditions — namely, a period of dry weather followed by a hard flushing rain. The hard flushing rain would drive the accumulated waste out of several drainage ditches into the main area of the Choctaw Bayou and would add a sudden, abrupt and very heavy B.O.D. load to waters of the bayou. This would result in fish mortality. The conditions necessary to set up this fish mortality were checked again this year and it has been found that the assumptions are correct. Steps have been taken by the Stream Control Commission to require the mills responsible to handle their waste in such a manner that this accumulation of waste in drainage ditches and the subsequent flushing out by heavy rains would not take place. It is hoped that during the next grinding season that this heavy fish mortality in Bayou Choctaw will not be observed.

Grand Bayou in Iberville Parish has been a chronic polluted stream during the sugar grinding season for many years. The inhabitants of the area have filed many complaints with the Department of Wild Life & Fisheries regarding the pollution of Grand Bayou and the resultant fish mortality. After a complete investigation of the conditions existing in the Bayou during the last grinding season the two mills that were considered responsible for the conditions were cited by the Stream Control Commission with "Cease and Desist" orders. These orders would require the two mills to dispose of their waste in such a manner as not to pollute Grand Bayou and connected flowage areas with sugar mills waste. The location of one of the mills makes it possible for the waste to be disposed of in the Mississippi River. The location of the other mill is such that it would be costly to dispose of the waste into the Mississippi River, but swamp areas are available for the construction of impounding basins to hold the waste a minimum of 15 days before discharging into ditches leading to state water bodies, and it is believed that this 15 day impounding period will result in the stabilization of the waste and the disappearance of the pollution of Grand Bayou.

Oil Field Wastes

The activities of the division in the disposal of oil field waste have become the most important part of the division's work in the past two years. The results of experiments conducted by a biologist working on other phases of oil field waste disposal have resulted in the disclosure that small amount of oil field brines in salt water are toxic to certain aquatic animals. Further, in thinking about this, it becomes evident then that the discharge of oil field brines into the fresh waters of the state probably would result in the damaging of the aquatic environment of those fresh waters. In view of this fact it is the belief of the writer that every effort must be made to keep oil field brines from entering the fresh waters of the state especially where the concentrations reach 3 to 4 thousand parts per million of chloride. This program will be pushed in the years to come with the view of cutting out all surface disposal of oil field brines wherever possible.

In the northern area the largest source of pollution from oil field operations is the Caddo Field in Caddo Parish. This field is one of the oldest fields in the state, and now it has only stripper production in that the percentage of oil is a small fraction of the total flow from the well, the rest being oil field brine. The separating methods used in these stripper fields are as follows: the mixture of oil and oil field brine which may be in the proportion of 1 to 100 is allowed to flow into open pits where the oil rises to the top and is skimmed off, leaving the salt water to be disposed of whenever possible. This means that in the disposal of this salt water into surface drains a certain amount of oil will be allowed to flow along with the salt water into whatever water body the salt water finally gets into. Normally the Stream Control Commission "Rules and Regulations" would apply to these fields and this method of separation would not be allowed to take place, but it must be realized that the money coming from one barrel of oil produced with the 99 barrels of salt water will not pay for the operation of regular separator such as are used in flowing fields where the ratio of oil to water is usually 50-50 or better. No means of reducing the pollution coming from these stripper fields such as Caddo Field is known outside of closing down the fields because of inability of the field operators to dispose of salt water underground. This is one of the main problems facing the division and the Stream Control Commission and no solution is presently in sight. The only aim that we have is to keep the oil content of the salt water discharge to an absolute minimum so as to avoid the contamination of the surface of the receiving streams.

Other fields in the northeastern area—such as, Belview and Bull Bayou—offer the same difficulty as mentioned above and the same efforts are being made to hold the loss of oil to an absolute minimum. In the Monroe area there are no stripper fields presently in production and the oil production in the area comes from so-called flowing fields. This means that there is not a great proportion of salt water produced as there is in the stripper fields and the Stream Control Commission has required the operators of the various fields in this area to construct retention basins for the salt water as well as to use disposal wells which is a preferable method. The cooperation of the manager of the Minerals Division Office in Monroe has been invaluable in the efforts of the Commission to cut down oil field pollution in this area.

In Central Louisiana the production of oil and gas is concentrated in LaSalle Parish. LaSalle Parish has a number of clear, swift flowing streams which head up in the high lands and flow southeast to Catahoula Lake. During the past two years there have been several cases of severe fish mortality resulting from high chloride content of these streams. The high chloride content, of course, has been caused by the discharge of oil field brines from oil fields in the south portion of LaSalle Parish. Legal steps have been taken by the Stream Control Commission to compel the operators in the fields in this parish to install subsurface disposal systems. This sub-surface disposal system program has progressed to the point that the gathering systems leading from the various tank batteries to the disposal wells have been installed and the disposal wells are now being conditioned to receive the brine. When this program, which will cost about $700,000, has been completed it will mean that Catahoula Lake and the streams which flow into Catahoula Lake from the north will be free of salt water originating in South LaSalle Parish. This program has received the approval of the companies producing oil in this area and will materially cut down the amount of oil on Catahoula Lake. Catahoula Lake has now been classified as a water fowl refuge, and more than ever it is necessary to make it a satisfactory water body for aquatic and water fowl life.

In north LaSalle Parish the problem is a little different in that the water flows down several creeks into Little River. Little River in the late summer and fall has little or no flow, and the chloride content sometimes builds up to the magnitude of 28 to 30 thousand parts per million of chloride. There is no question that chrloride content of this magnitude interferes seriously with the fish life that inhabits this stream. It cannot be realized the amount of salt water that flows into Little River until one sees salt crystallized on the bank of Little River 25 to 30 miles below the source of the brine. Another thing the salt water does is to collect on the bottom of the bayou and this results in complete oxygen depletion of waters in the lower part of the bayou which would therefore interfere with the rough fish such as cat fish and buffalo who are bottom feeders. To alleviate these conditions the Stream Control Commission has required the companies producing oil in the northern section of LaSalle Parish to start a survey preliminary to the installation of subsurface disposal systems. These sub-surface disposal systems will be installed in the flush or flowing fields, but nothing now is known that can correct the conditions resulting from the discharge of brines from Tullos-Urania Field which is a stripper field and which has the same operating difficulties that were set forth for the Caddo Field in the Shreveport area. Again, in this area, every effort is being made to cut down on the amount of oil allowed to leave the leases, but nothnig is known that will take care of the salt water outside of the shutting down of these wells.

In the southwestern part of the state, in the rice growing areas, the Stream Control Commission from year to year issues a so called "Rice Order". This order requires the impounding of all salt water during period of January 15th until such time in the fall that the Stream Control Commission determines that the discharge will no longer affect the rice irrigation waters. This program has been very successful and very few complaints of oil field brines in rice irrigation waters have been received by this office in the past few years. In the beginning of the program many operators in the southwest area used impounding basins, but it was found that excess rainfall and leakage caused such troubles that the vast majority of the operators have gone to the disposal systems with inevitable result of cutting down of the loss of oil from the various fields. From the period around October 15th to January 15th each year those concerns still using disposal pits are presently allowed to dispose of their oil field brines into surface waters. How much longer this will be allowed by the Stream Control Commission, in light of the results of the investigation into toxicity of oil field brines, is questionable.

In the area around Baton Rouge the Stream Control Commission has been notified of the pollution of Bayou Fountain caused by oil field brines originating in the University Field, East Baton Rouge Parish. At the present time the possibility of sub-surface disposal is being investigated. The main problem here in this field is the possibility of contamination of the Baton Rouge water supply by oil field brines pumped below the surface in the University Field located about 5 miles south of the town. Professional opinions rendered by geologists and subsurface water men indicate that there is no possibility of contamination of the water supply by oil field brines disposed of in underground horizons, and it is hoped that within the next year disposal systems will be installed in the University Fields and the pollution of Bayou Fountain will come to an end.

Control of oil field pollution in the coastal area is still being carried on by waste disposal inspectors working for the Division of Oysters & Water Bottoms of the Department of Wild Life & Fisheries working in conjunction with the Stream Control Commission. It is believed that conditions in the coastal oil fields are excellent and that little or no oil pollution exists at the present time. As far as the affect of the discharge of oil field brine into coastal waters is concerned, that matter is being worked on by biologists of the Department and of the oil companies and other industrial groups. Eventually it is hoped that hearings will bring out the effects of these oil field brines on the coastal waters and a decision will be reached by the Stream Control Commission as to whether or not such discharge of brines in coastal waters can be continued.

Processing Plants

Several times in the years gone by, pollution has resulted from the discharge of waste from sweet potato plants located in Sunset-Church Point area in that part of Louisiana southwest of Opelousas and Lafayette. This waste, which results from the processing of sweet potatoes with caustic and live steam, is very potent as far as oxygen depletion is concerned. Screens to take out the suspended matter have been installed by the majority of the plants and it can now be said that for the past two years no trouble has arisen from these sources. One thing that has come up in the last year is the use of various insecticides to control the sweet potato weevil. These various insecticides would be applied to the skin of the potato to kill the larva of the weevil while in storage in order that the infestation of the skin be reduced to a level required by the Department of Agriculture. The sweet potato must be washed before shipment. This would mean that whatever portion of this insecticide material that was on the skin would be washed off of the skin and into the streams. This matter is being handled by the State Department of Agriculture, and in as much as the head of the Department of Agriculture is a member of the Stream Control Commission and is represented on the Commission by his chief chemist, the matter is considered to be well under control. The process as it is being worked out by the Department of Agriculture will, in any event, include the necessary steps to insure that none of the materials used will reach state streams in toxic quantities.

Petroleum Refineries

As in the past the pollution problems arising from the discharge of waste from the various petroleum refineries has been handled with the cooperation of the Louisiana Petroleum

Refinery Waste Control Council. Step by step the pollution from the various refineries in the state has been reduced to the point that there are only one or two problems in the state to be solved before pollution from oil refineries is completely eliminated.

In the Baton Rouge area a rapidly falling Mississippi River sometimes results in the discharge of a substantial quantity of oil into the river from the bayou into which the Esso Standard Oil Company discharges its waste. This is due to the fact that the waste is trapped by the silt and deposited in the bayou during the high water months and an oil accumulation of several months is discharged in a matter of a few hours if the river drops suddenly. This matter has been under discussion with the Standard Oil Company, and there is no doubt that a suitable arrangement will be worked out to remedy this condition. The company has been extremely cooperative, and a good solution can be looked forward to.

In the Calcasieu River area, the fish mortality that has occurred in the past few years did not occur this last summer for one reason or another, probably due to the fact that the proper weather conditions did not exist. To have mortality in Moss Lake caused by refinery waste there must be a strong south wind for two or three days to hold up the water in the Rose Bluff Cut Off, and then there must be a north wind to draw down the oxygen depleted water into Moss Lake area. For some reason or other this condition did not arise last summer and so no fish mortality was reported from Moss Lake. The refinery located at Moss Bluff has a pollution problem that is tied directly to the water use of the Calcasieu River. During the late summer months the rice industry draws very heavily on the Calcasieu River and its tributaries for irrigation water. Millions of gallons a day are used, which means that the flow down past the lower Lake Charles area is reduced to as low as 350 to 400 second feet. This means that even though the waste discharged from the refinery is not toxic and has very little B.O.D., that the quantity of waste is such as to result in oxygen depletion under certain conditions. The temperature of the water is quite high mainly because the temperature of the intake water is relatively high in the summer time. The technical staff of the refinery is working on the problem of reducing the biochemical oxygen demand down to a point below what it is now, 15 parts per million. The question of reducing certain wastes of high

B.O.D. content but relatively little volume is being looked into at the present time. Also the possibility of the reuse of part of the water is being considered. This problem is currently being worked on by the refinery and by the personnel of the Department and the personnel of the Stram Control Commission and it is believed that substantial progress will be made in this in the next two years.

In the Norco area it is a pleasure to be able to report that the Shell Oil Company's $125,000 waste control program has been completed and that around 75% of the water that used to go down the borrow pit and which created an unsightly and dangerous condition is being diverted out of the borrow pit straight back through a 100 foot square skimming pit and into Lake Pontchartrain. That the water discharged into Lake Pontchartrain is not harmful can be attributed to the fact that both this Department and the Corps of Engineers of United States Army have put rigid restrictions on the amount of dissolved and suspended solids that can be in the water at the time it goes into the lake. These requirements are presently being met. The only water presently going down the airline highway is being discharged from the chemical pit overflow. The reason this water is not being diverted back through the separator and into Lake Pontchartrain is the fact that it does carry some suspended and dissolved solids which make it impossible to dispose of it in that region. The company is working on the removing of enough of these solids to allow this water to be disposed of through the new system. Eventually there will be no water discharged from the Shell Oil Company that will run down the borrow pit along the highway. The Shell Oil Company's personnel at Norco have been very conscious of their problem in the area and have done everything possible to expedite the construction of this new separator system. The Shell Oil Company is to be commended for its cooperation in clearing up this once troublesome condition.

Pine Products and Creosote Plants

Since the early days of the pollution abatement program here in Louisiana one of the most troublesome types of waste that has been encountered comes from pine products and creosoting plants because of the extremely toxic nature of the waste discharge from such plants. It is very pleasant to be able to report that, with one possible exception, the plants have made the necessary arrangements to take care of the waste properly and are no longer problems in so far as pollution is concerned.

In the DeRidder area both the pine products plant and the creosoting plant are presently constructing installations which will allow the companies to change the system entirely and to discharge no waste whatever into the state streams. In the DeQuincy area there is located the oldest pine products plant in the state. This company has made the necessary installation—spray ponds, skimming tanks and changes in the mill which have done away with the pollution of the Houston River. In the Covington area there is located a pine products plant and a destructive distillation plant and both are now discharging into Miles Branch which flows into the Tchefuncte River. As of this date there had been no trouble in this area, but a close watch is being kept on the Tchefuncte water shed to find out what effect this change in discharge methods will have on the river. The Tchefuncte River is presently being polluted by the discharge of domestic sewage from the City of Covington, and with this additional load coming in through Miles Branch some pollution may appear during late summer and fall. This location is presently being inspected at least once a week by one of the Department's Waste Disposal Inspectors. The newest pine products extraction plant built in the State of Louisiana is located in Oakdale, Louisiana, and is owned and operated by the Newport Industries, Inc. That portion of the Calcasieu River flowing between Oakdale and Oberlin has been subject to an intensive investigation by this Department with the view of restoring these waters to their natural condition. Data collected indicated that the waste discharged from the Oakdale Plant had a high B.O.D. and contained turpentine and similar compounds and at times has caused oxygen depletion to take place for a length of 10 miles below the point of discharge of the waste into the river. After this condition was brought to the attention of the Newport officials they retained a firm of consulting engineers to work out a waste disposal system that would allow the discharge of an effluent that would not affect the river in any appreciable manner. This problem is presently occupying the attention of the engineers, and it is believed that plans will be developed that will result in the removal of the dissolved material that carries the greater amount of the B.O.D. of the waste.

Sand and Gravel Plants

Pollution from the sand and gravel plants located in the various parts of the state has presented a major problem to this Department. This pollution from the sand and gravel plants is the one pollution occurring in the state that has been handled by the Department without the aid of the Stream Control Commission. Rigid enforcement has resulted in the cutting down on the silting of the streams to a point that it is no longer a problem here in the state. Such rivers as the Tangipahoa and the Amite have been cleared and it is now very much an exception rather than a rule to find them turbid from water discharged from gravel plants. In the Rose Pine area in Vernon Parish the polluted condition of Anacoco Creek and its tributaries no longer exist. In Rapides the pollution of Bayou Cocodrie has been a problem, but it also has been cleared up. In the northern part of the state in Webster Parish it used to be a matter of concern to the Division that the tributaries of Lake Bistineau were clouded during the period of low flow by water from the gravel plant screens. This has almost been done away with and it has been months since any complaints have come from this area. It has not been alleged by the Department that muddy water from gravel plant operations has any detrimental effect on the adult fish themselves, but two things happen upon the discharge of muddy water into clear streams. First is that the process of photosynthesis of plants growing in the water is interfered with which means that certain amounts of fish food are done away with because of lack of sunlight. The second and by far the most important is that it interferes with the renting of boats by boat camp operators. No fishermen will fly fish or bait cast in streams that are muddy because there is little or no chance of making a good catch. This means that the camp operator is interfered with in his making a livelihood, and this is against the interest of the State. The courts have held this to be true in several cases, and the remedies applied by the Courts have been efficient in all cases.

Conclusion

It can be said that definite progress has been made in pollution abatement in all cases where remedial measures can be determined, and application of these measures are not so costly as to put the industry involved in a bad position as far as competitive production costs are concerned.

Another important trend that can be noted is the increasing use of consulting engineers by the officials of manufacturing establishments in their efforts to solve waste disposal problems. The chemist of this division works very closely with these firms of consulting engineers in an effort to aid their work in solving the problems that they have been called upon to investigate.

There are definite indications that the industry's executives are beginning to realize that proper waste disposal is a very important part of their public relation program. Particularly this is important to any manufacturing establishment that offers its products for consumption in the retail trade, but it is also important to those industrial groups that manufacture raw materials or an intermediate product. That it can be important to the second industrial groups can be shown by stating that several times in the past few years good supplies of pulp wood trees have been burned by people who mistakenly thought that the officials of the mills were responsible for the pollution of streams in which the mills waste flowed.

This division has received the real and intensive cooperation of the Commissioner and the other department heads in the work of pollution abatement. All department heads realize of course that it is very difficult to enforce the rules and regulations regarding fish size limits and bag limits when fish are killed in the same area as result of industrial waste discharge.

In closing it may be said that the sugar mill waste disposal problem is the most important one facing the Department of Wild Life & Fisheries and the Stream Control Commission. The abatement problem from waste originating in this group of industries is complicated by the fact that the Industry as a whole is having serious financial difficulties due to the low price of the finished product and the high cost of production.

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